



Learning from the licensing of a papaya variety developed by the public sector in Costa Rica

A Case Study
Under UCR/IFPRI CAS-IP NPI Collaboration Project

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EXECUTIVE SUMMARY

The goal of the present case study is to describe the process that the University of Costa Rica's Office for Knowledge Management and Transfer (PROINNOVA) undertook to license the seeds of a new papaya variety, named Pococi, developed jointly by the University of Costa Rica (UCR) and the National Institute for Agricultural Technology (INTA, for its acronym in Spanish) from Costa Rica, in order to understand the institutional challenges that must be addressed by potential license seeking organizations in Costa Rica to ensure successful transactions. Learning from the multiple experiences dealing with the licensing context in this case study will certainly help ensure maximizing the benefits from licensing while minimizing costs and risks from such activity in Costa Rica.

An account of the facts in this case study, showed the process followed by PROINNOVA in its quest to license a papaya hybrid variety to a private company. The private company was selected following a professional and transparent process.

One of the important objectives of the licensing process was that both the UCR and INTA would delegate the production of seeds to a company with experience and a good distribution network to ensure diffusion to a broad range of producers. Furthermore, the license contract was made to consider both UCR and INTA serious commitment to safeguard the interests of small and medium-sized national producers. The licensing would allow researchers to develop more and better varieties for the producers themselves in the future.

Despite the fact that PROINNOVA followed a process that may be considered best practice, meaning a process committed to practice standards of management and technology transfer; external issues prevented granting the license. The fact that the UCR/INTA counterparts had not experience in IP issues and licensing caused an unnecessary delay. The signing of agreements did not ensure an adequate climate for the licensing process.

Certainly, the lessons and elements of best practice for practitioners discussed in this case study are valuable to those practitioners in other countries.

ACRONYMS

CAS	Central Advisory Service
CATIE	Tropical Agronomy Center for Research and Education (for its initials in Spanish)
CITA	National Center for Science and Food Technology (for its initials in Spanish)
FAO	United Nations Food and Agriculture Organization
FAOSTAT	FAO Statistics
INTA	National Institute of Agricultural Technology (for its initials in Spanish)
IP	intellectual property
MAG	Agriculture and Livestock Ministry (for its initials in Spanish)
NPI	National Partners Initiative
OECD	Organization for Economic Cooperation and Development
TRIPs	Agreement on Trade-Related Aspects of Intellectual Property Rights
UCR	University of Costa Rica
UPOV	(from its acronym in French) - International Union for the Protection of New Plant Varieties

1. Background

The papaya (*Carica Papaya*) is a colorful, delicious tropical fruit with many nutritional and medicinal properties. The economic importance of papayas is given by the different uses the plant and its fruit can have by consumers and industry. The ripe fruit may be consumed fresh, use to for the extraction of *papaina* (used as a meat tenderizer) and/or the green fruit is used by health and cosmetics industries, amongst its many uses.

Traditionally, papaya has been cultivated for local consumption in several countries: such as Brazil, Nigeria, India, Mexico, and Costa Rica. The FAOSTAT (2010) data reveals that average world papaya production from 2004 to 2008 was around 8,776,016 tons annually. In the last few years, overall exports have increased due to increases in consumer consumption in Europe and in the United States. In 2007, Costa Rica exported approximately US\$2.5 million to the United States and to Europe (FAOSTAT 2010). Annex 1 includes more detailed description of the papaya market.

Although consumption in the export and domestic markets are increasing globally, papaya consumption is not as high as it could be, due to problems with the supply of consistently high quality fruit. Production cycles were poor fruit quality coupled in some cases with over production (in some cases resulting supply and demand disequilibrium induced by changes in consumers intakes due to perceptions of low quality) tend to produce low fruit prices paid to farmers. This is the case in Costa Rica, where the papaya sector is always in crisis. The social impact combining poor fruit prices, fluctuating markets and loss in revenues, is serious because papaya is produced in Costa Rica mostly by small farmers.

With this context in mind, the University of Costa Rica and the National Institute for Agricultural Technology (INTA) pooled resources with the objective of developing new papaya varieties that have the potential of adapting better to Costa Rican agro-ecological conditions and most importantly, develop a variety with higher quality fruits suitable for the increasing export market. The aim of the UCR-INTA joint research project was to obtain a papaya hybrid that would be a better option to open-pollinated varieties by having better production characteristics and outcomes.

Licensing the new papaya variety represented several challenges to developers and IP manager organizations in Costa Rica. First, IP co-ownership is not easy to deal in practice. Second, in Costa Rica there is no intellectual property (IP) culture, meaning that the public -in general- does not understand and respect this legal instrument, thus the role IP protection may have in society. The lack of an IP culture and understanding of IP issues in Costa Rica, especially its role as a tool for facilitating technology transfer to producers, forced the licensing process to address several obstacles that proved binding to such an extent that the licensing eventually failed.

The goal of the present case study is to describe the process that the University of Costa Rica's Office for Knowledge Management and Transfer (PROINNOVA) undertook to license the seeds of a new papaya variety, named Pococi (see Box 1 and Annex 2 for a description) developed jointly by the University of Costa Rica (UCR) and the National Institute for Agricultural Technology (INTA, for its acronym in Spanish) from Costa Rica, in order to understand the institutional challenges that must be addressed by potential license seeking organizations in Costa Rica to ensure successful transactions. Learning from the multiple experiences dealing with the licensing context in this case study will certainly help ensure maximizing the benefits from licensing while minimizing costs and risks from such activity in Costa Rica. Certainly, the lessons and elements of best practice for practitioners discussed in this case study are valuable to those practitioners in other countries.

The purpose of this case study is to contribute building capacity in other developing countries in the area of intellectual property management through the detailed discussion of an actual case which was not successful in the sense that a license agreement was not reached after addressing several

institutional issues. Learning from failures and/or non-successful cases can be a better way of acquiring experience, especially when lessons can be drafted from such experiences.

The present case study provides a thorough analysis of the institutional context and issues that affected the outcome. An important lesson from the current case study is that having a broader and complete understanding of the environment in which a licensing process develops, is as important (or even more important) than the technical abilities and capabilities of IP and technology transfer managers guiding the licensing process. In developing countries, specially, intellectual property management is not just a matter of using IP to create business opportunities from its use. IP managers, especially those in the public sector, need also to consider developing an IP culture and the right environment to allow appropriate use of IP protection instruments.

The current case study in fact demonstrates that although University of Costa Rica's technology managers followed the licensing process by the book – in fact applying elements of best practice-including following a checklist of completed tasks for licensing the papaya variety, unexpected and unanticipated external factors during the licensing process, caused the failure of the licensing process.

Box 1 The Pococí variety

In order to stimulate papaya consumption in Costa Rica by supplying new varieties and new technologies of production, UCR and INTA developed, during a multi-year collaborative research, some reproduction material and seeds with commercial potential and adaptation to the country's edapho-climatic conditions.

The first of these varieties, called Pococí, after the name of the place where it was developed, is a semi-commercial hybrid released at testing level in 2001. This hybrid is characterized by its red pulp with an average weight of 1.35 kg and a brix (amount of sugar) ranging from 11 to 13, depending on the conditions under which it is cultivated. The productivity under a good technical management is approximately 90,000 kg during its commercial lifespan of 18 to 24 months. It is a very tasty fruit with very good appearance that immediately caught the appreciation of consumers. A good indicator is that the two main supermarket chains in the country immediately incorporated it into its line of products under two different brand names; in one store chain, it is called "Perfect Papaya" and in the other chain, "Supreme Papaya".

It is important to mention that prior to the development of this project, papaya producers used local varieties. The most popular of them is the variety known as Lucia. Also, some producers utilized to a lesser extent the Maradol variety and some other local varieties. All these varieties were very variable. The producers obtained the seeds according to their own convenience, therefore the fruits are neither good nor stable and without any attraction for the consumer
(Source: Mora 2009).

2. The Institutional Setting

2.1 The University of Costa Rica and the Technology Transfer Office

The University of Costa Rica was founded August 26, 1940. Since its official inauguration in March 1941, the University of Costa Rica has conducted its work in accordance with a constant, tireless, and autonomous search of the truth, efficiency, and beauty, as expressed in its Organizational Statutes¹.

The University's relations with industry developed during the 1970s. After laying a strong research foundation, the University of Costa Rica began providing scientific and technological services to the private sector in Costa Rica. The Office of Technology Transfer (UTT), created in 1990, rose from the need to develop stronger linkages with the private sector, and its key purpose was to manage the paid external link of the University with the private sector related to technologies adapted or developed by the University. After its creation in 1990, the UTT office started losing momentum given the difficulties of a limited internal and external environment encouraging technology transfer and innovation processes.

The UTT office focused on training during its first 4 years of existence. On subsequent years, leadership instability affected negatively office efforts to conduct tech transfer activities. The UTT office had more than 7 directors in the 6-year period after its initial implementation phase. At the end of the year 2000, the then Vice-President of Research – now the current President- decided to entrust the UTT office to a researcher from the National Center for Science and Food Technology (CITA). The CITA is a University of Costa Rica research unit working in cooperation with the Ministry of Science and Technology, and the Ministry of Agriculture, that has been widely recognized as the University's research center better linked to the productive sector in Costa Rica.

By the time the CITA researcher assumed the direction of the unit, it had led the unit's technology support program for the food industry for over six years. This change in leadership was the catalyst that began a transformation of UTT unit that lead to its specialization in the areas of intellectual asset protection and transfer of knowledge to support innovation efforts in the productive sectors. The UTT transformation process reached its operational peak in March 2005 when the current University of Costa Rica Vice-President for Research converted the UTT unit into PROINNOVA.

PROINNOVA was created in order to promote, facilitate, manage and support the efficient transfer of knowledge and the intellectual property of the UCR, with the aim of sponsoring innovation in the productive sectors through agreements or licensing contracts, authorizations, permits, or use concessions resulting compensation benefits to the UCR and Costa Rican society.

PROINNOVA's mission is to manage the university's intellectual property and to facilitate the licensing of knowledge generated by the UCR academic endeavors. To achieve its mission and purpose, PROINNOVA directs its work towards the benefit of the University community, encouraging an environment that supports innovation in the Costa Rican productive sectors through

¹ The origin of the University of Costa Rica goes back to the Santo Tomás House of Education, founded in 1814, which later in 1843 became the Santo Tomás University. The University of Costa Rica has approximately 35 thousand students of whom 5300 are graduate students, 3500 faculty, and 800 researchers; there are 13 departments, and 40 research units in all areas. The University also has 26 research centers, 12 institutes, 8 field stations and experimental farms, and 4 special units. 70 % of the indexed national scientific production and 50 % in Central America is made in the University of Costa Rica. The University has a very strong research component and is well recognized nationally and internationally. The University of Costa Rica is currently among the best 25 universities in Latin America (see http://www.webometrics.info/top100_continent.asp?cont=latin_america).

a trained and multidisciplinary team that works identified with the values of innovation, ethics and commitment.

PROINNOVA addresses critical tasks -among others- including identification, harmonization and dissemination activities in order to support innovation in the productive or government sectors and to protect intellectual property. Furthermore, PROINNOVA manages, negotiates, and administers licensing contracts or any other granting of rights to users of its innovation outputs. For the execution of its duties, PROINNOVA has a regular operational budget, as well as revenue obtained from its own activities, and a percentage of the fees generated by contracts managed by its staff.

The income distribution mechanism produced by its activities seeks to arrange and strengthen the generation and management of technologies and services that have potential to be transferred to users. The income distribution mechanism has three stages according to the level of the income generated:

- First distribution: applies to all income, in as much as the accumulated total income does not exceed US\$200,000 (two hundred thousand US dollars). The intention of this specific distribution clause is to especially favor knowledge developers. In this clause, developers would receive 60% of generated income, while 30% would be for the institution, including the academic unit as the main institutional beneficiary, and finally 10 % for management.
- Second distribution: applies to all income obtained in the excess of US\$200,000.00 but less than US\$500,000 (five hundred thousand US\$). This distribution clause seeks a balance between developers and the institution, addressing participating academic units, institutional development fund, and a special fund administered by PROINNOVA to deal with registration of patents and trademarks that nationally and internationally have very high costs. The percentages are 45% for the developers and 45% for the institution and 10% for management. An important lesson from our own experience is usually only 20% of registrations produce any revenue; therefore no investment in registration decision should always take into account the fact that not all registered products will generate sufficient funds to recover the registration investment.
- Third distribution: applies to all income in excess of US\$500,000. This distribution clause seeks to favor particularly the institution with 60%, since at this stage generated income has already reported significant benefits to researchers who have made it possible. They get 30% and 10% for management.

2.2 Protecting intellectual property resulting from agricultural research

Intellectual property related to agriculture is protected by various types of rights depending on the nature of the property needing protection. Relevant forms of protection to the current case study include:

2.2.1 Plant varieties protection

Most developing countries have recently adopted legislation for compliance with the TRIPs (Agreement on Trade-Related Aspects of Intellectual Property Rights) requirements related to protection of plant varieties. TRIPs related laws offer a system of intellectual property protection commensurate with the needs and conditions of conventional breeders. TRIPs laws are designed to offer additional incentives for developing new varieties, while respecting traditional agricultural practices.

TRIPs related laws typically grant protection to new, different, uniform, and stable plant varieties. Novelty, in particular, requires that the variety has not previously been sold to users in a jurisdiction. Although, depending on the country and species, a grace period of one to several years may be

granted to the applicant. The distinctiveness characteristic requires that the variety pending protection is clearly distinguishable from other previous (existing) varieties. Uniformity and stability require that the variety is uniform and that it truly reproduces its phenotype and genotype, yet, uniformity and stability are defined in such a way allowing the protection of hybrids.

Plant variety protection laws are usually adopted in accordance with an international treaty called UPOV (from its acronym in French) - International Union for the Protection of New Plant Varieties. This treaty has two different versions - (1978 and 1991). Some countries are members of the 1978 Convention and others of the 1991 Convention that contains some small varying regulations.

Box 2 Important differences between UPOV 1978 and UPOV 1991

- The '78 Act covers plant varieties of nationally defined species or genera, whereas the '91 Act covers plant varieties of all genera and species.
- The protection period is minimum 15 years under the '78 Act and minimum 20 years under the '91 Act.
- The protection scope under the '78 Act is production for the purposes of commercial marketing, offering for sale and marketing of propagating material of a protected variety. The '91 Act adds, among other things, exporting, importing, and stocking for the above purposes of the protected material.
- Breeders are free to use a protected variety to develop a new variety under the '78 Act, but not if it requires repeated use of that variety. Under the '91 Act this exemption is restricted and, among other provisions, it is not allowed to produce varieties which are essentially derived from a protected variety or which are not distinguishable from such a variety.
- Farmers are free to use their harvested material from a protected variety for any purpose under the '78 Act. Under the '91 Act, national governments are entitled to decide whether farmers shall be allowed -- within reasonable limits and safeguarding the legitimate interests of the rights holder -- to reuse the harvest of protected varieties on their own land holdings without the authorization of the rights holder. It would not be allowed to exchange or sell such material.

Source: <http://www.grain.org/bio-ipr/?id=458>

2.2.2 Patent protection

With a patent, an exclusive right is obtained to prevent a third party from using or exploiting the invention without the authorization of the owner. The patent is a document, a title that the State provides to the inventor granting an exclusive right on his/her invention. Patents are usually granted for a period of 20 years. For an invention to be patentable it has to meet three basic requirements: 1) the invention must be new, or not having been known anywhere in the world before the application, with some exceptions; 2) the invention must have inventive step, in that it cannot be obvious to a person with average knowledge on the matter, and 3) the invention must have the potential of becoming an industrial application, that is, the invention must be useful or have a specific use.

In some countries, it is now feasible to protect biological material such as plants, animals, genes, and microorganisms through a patent. In the majority of the developing countries, however, it is not feasible obtaining patents on plants. The patent by itself includes both the description on how to use the invention as well as the establishment of a few claims that precisely define the exclusive rights granted by the patent. Obtaining a patent is a slow and more expensive procedure than the plant variety protection certificates granted to plant breeders.

Patents are territorial meaning that they grant rights within the country where they are granted, for a limited time and in accordance to specific national laws. A patent owner must be willing and able to defend his/her rights in court to prevent violations, which may be very expensive action. In most countries, patent laws contain a research exemption which allows the use of protected inventions for academic and research purposes only.

Given that patents do not allow the use of the invention to develop another invention and also allow for the possibility to protect genes and specific characteristics, as well as their products, they are the ideal means to protect genetic engineered plants and components including transgenic events and genes of interest².

2.2.3 Protection by means of undisclosed information

Some intellectual property assets do not conform to the above mentioned types of right protecting instruments. The IP holder can simply choose not to seek protection by these means after a careful evaluation of costs, benefits and risks from seeking protection. Protection of trade secrets or undisclosed information may be a good choice in these situations. Any confidential knowledge that provides its owner some form of commercial or technological advantage over its competitors can be considered as industrial/commercial secret. The strength of protection in this option depends on the ability to keep the information secret or confidential.

Protecting information through confidentiality can be difficult. If the information is made public, the protection is lost. Certain types of property are bad candidates for the protection of industrial secret simply because the product information is evident and is revealed by the product itself. Some biological materials fall within this category.

On the other hand, other forms of biological material are easily protected by means of confidentiality due to their inherent nature. A good example is plant hybrids since they cannot be reproduced without access to the specific parental lines used to derive the final product. Inventor can seek protection of specific hybrids through trade secret, but may also seek other types of protection for the parental lines themselves. Protection of genetic material as industrial/commercial secret is not seriously compromised when the seed of the hybrid is sold to farmers as back-engineering to parental lines is almost impossible.

This form of protection has been sufficient to grant the necessary incentives for investment in research in hybrid seeds. Additionally, farmers are not able to produce their own seeds without suffering significant losses due to the loss of hybrid vigor. This form of biological protection in accordance with the strict control of parental lines has resulted in excellent protection of intellectual property.

2.3 IP Laws in Costa Rica

The discussion in the previous section show that there are in theory three options for protecting the papaya variety involved in this case study including plant variety protection, patents and trade secrecy. Before continuing our discussion of the licensing process of papaya variety developed by UCR/INTA, it is important to discuss the protection possibilities offered by Costa Rican law.

² Here, it is worthwhile separating design and utility patents. Design patents refer to those ornamental design, configuration, improved decorative appearance or shape of an innovation. In the U.S. a design patent lasts 14 years. In contrast, utility patents protect new inventions or functional improvements of existing inventions. In the U.S. a utility patent lasts 20 years from the date of filing patent application.

In Costa Rica, patents are granted by means of regulations contemplated in the Patent Act. However, patenting the UCR/INTA papaya variety was not feasible as under Costa Rican law, scientific discoveries are not (automatically) considered to be inventions, and therefore are not patentable. Thus, neither plant varieties nor animal breeds are considered inventions and thus not patentable under Costa Rican law.

Plant varieties in Costa Rica are (now) protected by means of a special law that was under development at the legislature at the time of the licensing process described in this case study. Currently, the Plant Variety Protection Act is in effect at the moment and thus new papaya varieties may be protected using that mechanism.

Since neither plants nor animals are patentable, thus immediately excluding the possibility of protecting transgenic plants and animals. To date, the standard in Costa Rica is that absolutely nothing that involves a biological material can be patented. But there are specific laws protecting confidential information or secrets. This was precisely the way of protection chosen. Parental lines were kept confidential and that is how they were going to be licensed to the company.

3. The facts in a historical timeline for product delivery

3.1 A seed, a hybrid and co-property

Research processes are not static, where every detail is planned and outcomes are the result from a planned layout. In most cases the researchers have some ideas they start to work with and share with their peers or counterparts. As in any human activity, interpersonal relationships and identification of various capabilities to combine efforts and achieve a shared goal is the common denominator. For the development of the Pococí papaya variety, this process was launched several years ago. In 1995, a research project was first submitted to the Vice-presidency for Research of the University of Costa Rica (UCR) titled "Obtaining improved varieties of papaya and technologies associated with its handling".

The papaya is a fruit with extraordinary nutritional qualities; however, consumption in Costa Rica was quite low at the time (approximately 8.5 kg per capita). Although there was no solid scientific basis, researchers at the time thought that a key factor helping explain low consumption in Costa Rica was low palatability and/or quality of existing varieties planted, hence the idea of providing farmers with new varieties and better technologies. Since the UCR did not have lands available in suitable climate zones for cultivating papayas, researchers contacted the Ministry of Agriculture (MAG) that has an experimental farm located in the city of Guápiles (located in the Northeast Caribbean side of Costa Rica) which is an ideal climatic zone to grow papayas. The joint UCR-MAG collaborative relationship is a major cornerstone of the papaya variety development project.

Researchers began joint research work, developing projects and obtaining funding and support from their respective institutions, and together started to achieve good results. As often happens in collaborative research in universities and other research centers, such collaboration occurs without previously established formal agreements between the institutions.

By way of illustration, the overall objective of the initial project was to encourage cultivation of new varieties of papaya under modern management techniques thus contributing to increase competitiveness of the local productive sector. The specific objectives included 1) production of papaya lines and hybrids with excellent commercial and agronomic quality, 2) improvement of papaya germplasm, 3) development of management techniques for the varieties that were produced and 4) transfer of varieties and management techniques to different groups of producers in the country, as well as advice and guidance to organized groups of producers that adopted these varieties.

Practitioner's Lesson #1

A necessary condition prior to the development of collaborative projects is to explicitly set the ownership of the results derived. The usual way is through previous contracts. Such contracts should regulate the possibility of future licensing if products or commercial processes susceptible of protection are obtained. Contracts should contain aspects of research on the one hand, as well as other aspects of management of these results (Bair 2007).

For this reason, it is desirable that upon deciding the need to work collaboratively and after the objectives of the projects have been established, the collaborative groups need to address some necessary anticipated steps towards answering these questions.

In this particular case, in spite of the importance of the objectives set out at the beginning of the research project, and that it looked like its aim was to create final products, such as new varieties or new technologies related to the production of papaya, the importance of establishing prior agreements between the two institutions involved was not foreseen. Therefore, the whole research process was conducted without having such previous agreements.

While this is not an ideal situation, it should be recognized that it often happens. Most of the time, the research process simply develops and evolves so that researchers do not stop and think about the implications for the institution of obtaining results from research without having cleared the conditions of the ownership of these results. As most of the time researchers are more worried about developing their projects and publishing their results and forget to protect them or otherwise disseminate them, and therefore they do not visualize IP problems in the future. Joint publication does not present the type of problems found when protection of the results is desired through some other means of intellectual property right protection. Researchers are more familiar with details of joint publication and see this as an easier option to implement.

To better understand the whole licensing process, it is necessary to mention that the National Institute of Agricultural Technology (INTA) was created in 2001; henceforth all the MAG departments that were involved in research and development processes joined this Institute which has independence but is an agency attached to the MAG.

Table 1. Steps and recommendations for implementing a collaborative project

Steps	Recommendations for Implementation
1. Determine if the institutions involved have a focal point or unit that addresses IP issues 2. Determine if the institutions have an IP policy.	• Determine and identify individuals, mechanisms or instruments that can help the members with the issue. • Obtain support from existing resources. • Socialize existing policies and determine if each one of these policies has implications for joint work.
3. Establish rules for publications.	
4. Determine the IP or previous knowledge provided by each party.	Systematize and specify these inputs.
5. Determine if there was external funding or any other type of previous commitments that could impose specific conditions in regard to IP.	Solve the problems, if any, negotiate, consult, obtain advice.
6. Determine the use of appropriate technologies and inputs provided by third parties.	Solve the existing conflicts by means of licenses, alternative technologies, agreements, tolerances

7. Determine possible products derived from the results of the research and the means for their protection.	Take necessary precautions
8. Establish agreements, ownership agreements on the results, alliance agreements, or cooperation agreements.	
9. Determine protection strategies.	
10. Determine the individual(s) that will conduct the follow-up, and also who will manage the protection issues, licensing, etc., of the results.	

Source: Developed by Silvia Salazar 2009 ©

3.2 At the crossroads: free dissemination or licensing

For a better understanding of the processes of transferring results to public institutions, some explanation is necessary as to the context in which they occur. The researchers involved in the process approached the formerly named UTT unit, now PROINNOVA, as a result of farmers and final consumers' pressures being exerted on them to have access to the seed.

To meet the objectives of the papaya project for years 2000 and 2001, three open-pollinated varieties were released. Initially five farmers in the Guácimo and Guápiles region planted these varieties on a small scale. However, in spite of an initial good reception, the subsequent release of the experimental Pococí hybrid induced those same producers to prefer the Pococí variety. The formal introduction of the Pococí hybrid to a small group of organized producers, as well as to a few small and medium-sized independent producers happened in the year 2002. This hybrid fruit had an excellent acceptance among consumers.

During 2003, the production of the Pococí hybrid seed was increased to approximately 30 hectares. The main recipients of the seed remained to be organized farmers as well as some independent producers. Researchers estimated that by 2004, the project might produce hybrid Pococí seed for 60 to 70 hectares in order to keep the commitments made by farmers with marketing companies and producers. However, the papaya project had to reject a large amount of seeds requests due to limitations in infrastructure, labor, and budget.

Given that a large seed market had developed enough to interest private companies for seed production and sale, in 2003 researchers approached PROINNOVA in order to explore the possibility of initiating the papaya seed transfer process. When the researchers brought their concerns to PROINNOVA, this office began a process of conducting a study that would analyze and determine, within the context of the public mission of the UCR, and the aspirations and functions entrusted to the PROINNOVA office, what would be the best choice for releasing the new papaya variety seed. The performed analysis included issues such as the environment for releasing the seed, define ways and IP instruments to protect seed IP. Furthermore, the study included considerations as to continue producing at the level allowed by the project, or initiate a licensing process with a private company. Finally, the study defined what type of enterprises qualified to become a potential licensee, negotiation terms and acceptable performance and income levels.

As indicated in the first sections of this document, there was no option of protection by a patent, nor was the possibility of protection in Costa Rica through a plant breeder title because legislation had not been adopted at that time when the new papaya variety was developed. However, a crucial advantage for protecting the UCR/INTA IP contained in the papaya variety was the fact that the seed was a hybrid, thus protected by its own nature, where there is a loss of hybrid vigor and thus diminished performance if producers planted the seeds of a hybrid fruit.

When considering these possibilities within the project, the confidentiality issues were strengthened given that, as seen in the respective section, while the undisclosed information constitutes a very strong protection, it is also true that the strength derives from the ability of the holder of information to keep it confidential. In this case, maintaining confidentiality was relatively simple because there were only two researches involved. They have a close friendship between them and a great sense of teamwork; therefore it was not difficult to having them become aware of the need to maintain strict confidentiality on the parental lines of the hybrid parental lines.

In Costa Rica the culture of protecting plant varieties does not exist. Furthermore, the seed system is overall under developed in the country. These are somewhat obvious outcomes from the fact that there was no plant variety protection option until 2008. The seed sector consists of the government, mixed and private entities, whose scope of operation tends to be related to the production of seed for human consumption. There are, in Costa Rica, some sectors that have relatively important developments as related to seeds. For example, the rice seed industry has a very efficient research program centered on breeding. In the palm oil sector, there is at least one company that maintains a genetic improvement program, and also some other very specific cases of seed production. However in many cases there are other organizational arrangements that depend on the specific sector of interest. Farmers buy in some cases imported seeds such as the case of horticultural crops. In another example, in the coffee sector there is a state agency that does coffee R&D while producing and releasing new varieties. A similar arrangement applies to the banana producing sector. In other crops, agencies or international centers are also involved as in the case of CATIE (Tropical Agronomy Center for Research and Education).

A deep-rooted culture is that the government, in some cases, through the Ministry of Agriculture and Livestock (MAG), the National Production Council (CNP) or the INTA develops varieties and releases them through their extension programs. The University of Costa Rica also takes part in these processes and releases varieties depending on the field of interest of its researchers. These options lack a well structured system of production and distribution of seeds.

We need to stress here that PROINNOVA, with the licensing option, was facing a really different option and a considerable challenge, since it represented a very different way of conducting business. This is especially true for INTA, as the organization had a very difficult time implementing the new process and perhaps this was the reason for taking a long time to make decisions. Convincing INTA about the benefits of this process constituted a difficult task, and there were doubts and questioning on their part during the implementation of the licensing process. In fact, many people had to be convinced about the benefits of licensing. This was a hard task to accomplish as it was implemented within the context of lack of information and especially a lot of misinformation and misunderstanding. For the UCR, the process was not new, since some experience had been generated in other types of licensing.

On the other hand, the licensing of undisclosed information also presents challenges as the UCR and the INTA are public entities. This type of licensing could be perceived as improper and thus distorting their public missions. However, the experience gained by PROINNOVA allowed to properly justifying this option given some elements such as:

- a. If the knowledge was freely disseminated, in this case the parents of the papaya hybrid, the development of the seed would be entirely defined by market forces. If this were the case, large companies would most likely be the ones that would benefit more from the new variety and would have major productive and market advantage compared to small and medium size producers.
- b. If large companies indeed gain access to the new papaya seed early, they may be empowered to capture the export markets potential of the new papaya variety. Thus ensuring that the large companies would produce for export and the local market would be saturated with second quality papayas with very low prices.

c. So the possibilities of improving small farmer's livelihood were reduced by not ensuring access through licensing.

Taking into account the above, keeping the information secret would enable the UCR and INTA to seek the benefit of small and medium-sized farmers, preventing or restraining the possibilities of big local companies and transnational corporations of capturing entirely the benefits from innovation brought by the new papaya variety.

3.3 The initial action plan and the UCR-INTA cooperation agreement

As an input for the decision-making in the technology transfer process, PROINNOVA had to follow the regulations of the existing **“Best Practices Manual for Remunerative Relationships of the UCR”** with the external sector.

In regard to transfer models, this manual indicates:

- 3.1 With the transfer of technology or services developed or adapted at UCR, the institution will try to obtain the greatest possible benefit for the development of the country, the welfare of Costa Rican society and institutional development, and will be under the responsibility of the Vice-presidency for Research.
- 3.2 To define the beneficiary (ies) of the transfer and the terms of negotiation, the following aspects shall be taken into consideration in order of priority:
- 3.2.1 It must ensure an appropriate balance between social, academic, and economic benefits of the transfer.
- 3.2.2 Relationship schemes should be encouraged where risks and benefits are shared among the beneficiaries of the transfer, and in direct relation to the degree of contribution of the parties.
- 3.2.3 It should encourage the development and competitiveness of companies with national capital that have organizational structures where the distribution of profits is maximized.
- 3.2.4 In case of transfer to other type of companies, some kind of protection, compensation, or benefit for national companies or the Costa Rican society in general should be negotiated."

The transfer model that the PROINNOVA followed at the moment and used for the transfer of the Pococí hybrid is embodied in Figures 1 and 2.

PROINNOVA conducted the transfer task by seeking all available information about papaya including trade, uses, and possible interests and uses in both national and international production. An overall requirement for all officials involved in the licensing process was that they had to have sufficient knowledge about papaya to address the licensing. The training acquired by the office regarding competitive intelligence, information finding, and data collection was extremely valuable for this process (Solleiro and Castañón 2008).

Figure 1 PROINNOVA transfer model

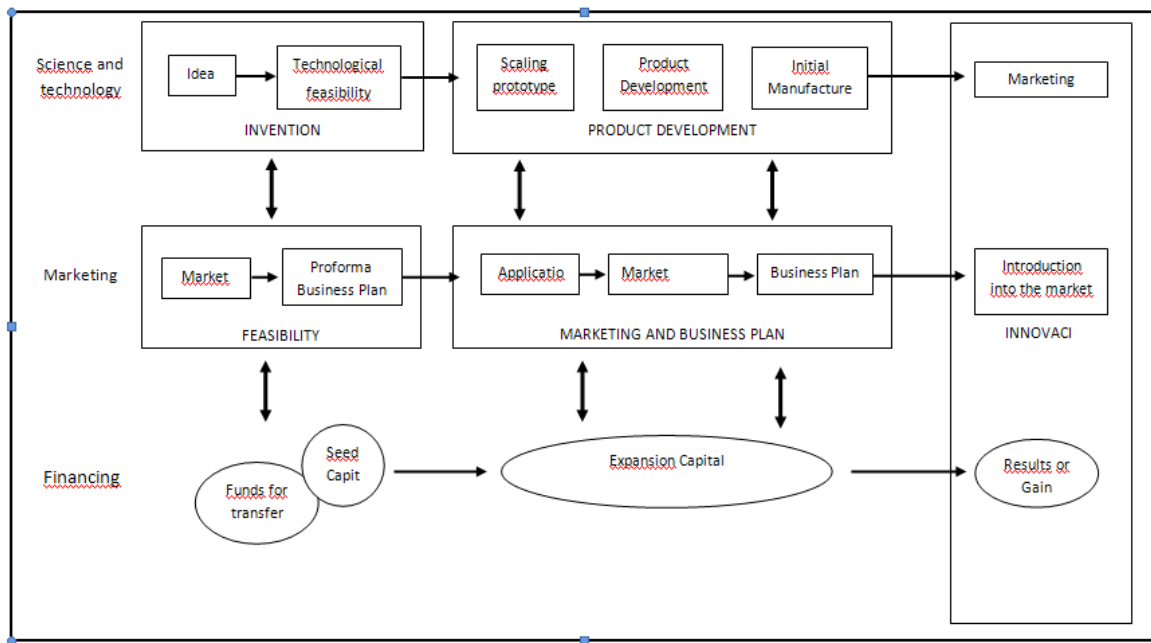
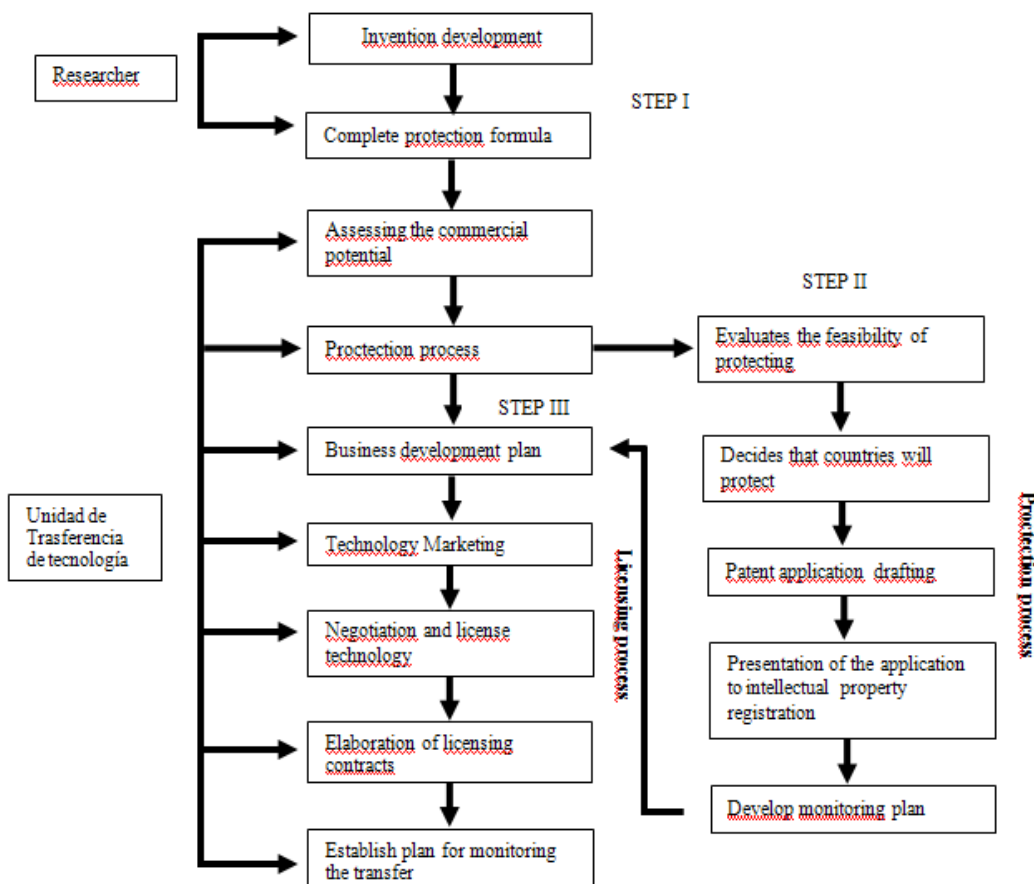


Figure 2 PROINNOVA transfer model steps



At that time, for example, the production costs of the institutions were available, which served as a point of reference for the possible licensee, which meant that the cost for the licensee to produce

the seed was known. A well defined fact in the analysis- and through field experience- was that it was very expensive for the UCR and INTA to continue producing papaya seeds. Perhaps the highest opportunity cost was the time and money invested in the production of seed instead of continuing the R&D to produce more and better varieties. The breeding process is expensive and time consuming and the best solution for R&D organizations is to continue doing what they do best, which is R&D and thus continue producing more varieties.

All this background was good for an initial action plan; nonetheless, prior to implementation it was necessary to establish a **cooperation agreement with INTA** covering the issue of co-ownership and then address the licensing process. This cooperation agreement would have to contemplate the fact that it was not an *a priori* agreement, that the research processes was already under way to such an extent that there was already a preliminary marketable product.

The key issues of the agreement most relevant to this case study are:

- a. The establishment of where-as statements framing the agreement and explaining all the background to the project. This part was very important because, as stated, a research process had started long before the signature of the contract.
- b. The scope of the agreement states that past and future activities of the collaborative relationship between both entities are included. This part was also very important, since it was intended that researchers continue collaborating and developing new varieties and new cultivation and production techniques for the benefit of the papaya-producing sector.
- c. The inclusion of a clause on intellectual property rights derived from the joint research that sets a proportion of 50% - 50% of co-ownership for each institution. That percentage was established on the basis that it was considered that both institutions were doing equal contributions on material and intellectual resources. However, it was established that if at some point these contributions varied, any of the parties could request a review of these percentages and a special joint committee would be established to study the issue and reach thereby an agreement.
- d. A specific clause whereby the parties agree that it should be PROINNOVA the office in charge of the entire administration or management process of the intellectual property rights derived from the collaboration activity. Thus PROINNOVA would be responsible for management, marketing, licensing, or any other type of commercialization of the results of the joint research. To guide the work of the PROINNOVA in the above-mentioned aspects and follow-up the agreement, a Coordination Committee was created composed of the following members: the director of PROINNOVA and the researcher from the UCR, the Director of INTA or whom he/she delegated, and the researcher from INTA. All strategies would be discussed and planned by this committee.
- e. The inclusion of a clause whereby it was agreed what to do with the by-products of the research or the sale of fruit produced in the project plantations. It was decided in the agreement that if the plantation was on a terrain that belonged to a specific institution, that institution would market the product according to its own procedures. However the economic benefits would be used for the project itself.
- f. The inclusion of a confidentiality clause, which, as noted above, was of huge importance, due to the characteristics of a licensing of undisclosed information. The important thing about this clause was that each institution be committed to ensure the confidentiality of their employees, a key requirement to obtain protection under the Non-disclosed Information Law in Costa Rica.

Practitioner's Lesson # 2

It is possible to make some comments on these points. Firstly, the fact that the other institution had no experience in the field of handling or managing their IP resulted in this process being a little difficult. The establishment of the Committee was a way to build trust with the counterpart and for them to feel included in the process. To start an alleged learning process was also an objective of the committee. Unfortunately at the end this effort was not very successful and INTA is still struggling with this issues.

There may be many reasons for this, but the most important is the fact that the director took much of the process on his own back and then he departed from the institution, therefore the lessons learned were not used to the advantage of the institution. This lack of experience from the counterpart also forced PROINNOVA to document the whole process and to rethink and reconsider many of the steps to take and strategies which is somewhat fine, albeit time-consuming. In relation to confidentiality, at this time this seemed to be irrelevant because licensing did not come into effect. However it should be mentioned that the INTA officials never signed the confidentiality agreement. The reason for this is that the INTA does not have an office or a focal point responsible for the follow-up of these agreements or for the management of the intellectual property of the institution (Ritter 2008).

3.4 Looking for licensees: the first three candidates

As usual in a licensing process, PROINNOVA began to identify potential licensees. The collaboration of researchers was crucial for this first selection. Two companies were identified, one already consolidated, and a new one in the hands of a young entrepreneur. There was also an individual interested in investing in a new business. Letters offering the license and asking if they were interested were sent to these three candidates. The process described here was how the first contacts were made with potential licensees and/or interested parties.

Practitioner's Lesson #3

It is common practice that researchers are the primary source for potential licensees. They are best qualified to identify companies or individuals interested in new products, processes, or technologies (Source: Krattiger and Mahoney 2007).

3.5 A co-owner's initial doubts and the second three candidates

Despite the fact that the process had already begun and that there was an agreement signed by the parties indicating that the UCR was responsible for the transfer process, in practice, this guideline was not completely fulfilled. A Coordinating Committee had even been created where strategies were discussed. At the beginning, PROINNOVA considered that the agreement reached among the members of the Coordination Committee would be enough to make decisions, but later it was evident that even with the provisions of the agreement, important decisions had to be consulted with the Board of Directors of INTA. This further delayed the process and forced to keep justifying each step that was undertaken.

When the director of PROINNOVA presented the list of potential licensees to the Board of Directors of the INTA, doubts began to emerge within the INTA Board on the potential licensee choices. The INTA Board members wanted to make the process as transparent as possible, preventing it from appearing as an election made within a closed circle. The Director PROINNOVA considered the opening of the process a good suggestion, and thus proposed a public offer for bidding in a newspaper with national coverage. At the end of the process, the INTA Board concerns turned out to be prophetic, and the suggestion to open the process proved to be an excellent idea that helped to enhance the legitimacy and transparency of the whole process.

The processes followed for a public bid was the publication of a notice in one or two national newspapers whereby the institution communicates to the general public the development of the variety and its intention to license such development. Any person can communicate her intention to participate in the bid process. The notice was published in a major national newspaper and in the university weekly journal. The public offer is a strategy to attract licensees, not found in the scarce literature on licensing strategies. PROINNOVA knew about public offers from a staff member that made an internship in the technology transfer office at Iowa State University and at Michigan State University. These are public universities that have an important component of agricultural research as well as a history of collaboration with the UCR, and at some point they both had used the public offering to choose licensees for varieties produced by its researchers. Box 3 contains the actual public notice published in printed media.

In the case of the Pococí variety, the public offer bid process proved to be a very interesting possibility at a time when the partner was not sufficiently comfortable with the licensing process and PROINNOVA wondered how to open the process of searching for licensees. Most importantly, the need existed to define how to do the public bid offer in the most transparent way so that there were no doubts about anyone in particular being favored. This is very important in a public institution, especially at times when the processes are consolidating and it is very important to gain experience.

The basic information needed to prepare the announcement was taken from the initial analysis process. The intention when drafting the public offer was to do so according to the country circumstances and the environment in which companies were used to operate where, as mentioned previously, there are few or no seed companies or a culture of plant variety protection, especially in the papaya sector. The information gathered to identify the first three companies formed the basis for the public offer.

Box 3. Public Announcement for Licensing

Unit of Technology Transfer (UTT)

Communicates the opportunity for technology transfer for

PRODUCTION AND SALE OF COMMERCIAL SEEDS OF THE POCOCÍ PAPAYA HYBRID

Jointly developed with the National Institute of Agricultural Technology (INTA) of the Ministry of Agriculture and Livestock

The technology will be transferred through a licensing contract according to Law 7975 on Non-disclosed Information, and will be awarded with partial geographical exclusiveness.

Desirable qualifications of possible licensees:

- History of commitment with the development of the agricultural sector and the national producers;
- Own greenhouses or have the possibility to build them on short notice;
- Previous experience in the production and distribution of sexual or asexual seeds;
- Capacity to collaborate in the design and transfer of a technological package for the production of this variety.

The validation tests of the hybrid have been positive in regard to production, commercialization, and consumption; therefore a growing demand of the seeds is expected in the coming years.

The interested parties may communicate with the UTT before March 12 of this year

Information: Phone: 207-5835, Fax: 283-4262, Electronic Mail: uttucr@cariari.ucr.ac.cr

With the collected data and information, as well as the parameters laid down by the Best Practices Manual of the UCR, the decision making process were set in advanced which considered parameters by which to rank companies based on scores. **The parameters established were:**

- a. Commitment with the development of the national agricultural sector
- b. Stability, managerial, administrative and financial capacity
- c. Ability to invest on a short term basis
- d. Capacity to produce sexual and asexual seeds
- e. Capacity for the distribution of seed
- f. Ability to transfer the technological package
- g. Capacity for the distribution of the seed at the national level
- h. Respect for the guidelines established by INTA-UCR

Six companies or individuals responded to the notice, including firms established as agriculture/farming suppliers, one university, and at least one individual in search of a business investment. Two of the first contacted firms showed interest for a second time. The managers of all these firms were interviewed and comparative tables with the information submitted by each were prepared. These charts were subject to a comparative analysis and the weighting of results.

The analysis found that there was an ideal firm for licensing, and also provided for the possibility of a second company in case the negotiations with the first did not come through. This option was preferred over an auction among the bidders, more often used in developed countries, since it was considered that this was a new option and there was no point in having all the interested parties competing over a model of business that was little or unknown to all of them.

Practitioner's Lesson #4

The importance of training and above all, the internships in IP offices with experience in the main research lines of the institution should not be disregarded.

3.6 Negotiations between two parties – The easy part

In order to continue with the process, the Coordination Committee met and agreed that the negotiation process should start with the company that was first selected. Then the following actions were taken:

- The company was notified of the intention of PROINNOVA to initiate negotiations and the need to sign a confidentiality agreement.
- After the confidentiality agreement was signed, the Director of PROINNOVA presented relevant information to the company officials regarding the transfer process and the transfer characteristics themselves, as well as the cost data related to the production of seeds.
- The presentation emphasized on the elements that constituted the main objectives for INTA and the UCR regarding the results of the transfer process, in order of priority namely:
 - To make the hybrid seed available to the broadest number of producers, at a reasonable price;
 - To contribute comprehensively to the development of the national papaya sector;
 - To make the INTA-UCR papaya seed breeding program sustainable.
- A reasonable time was granted to the company to study the documentation and submit a basic proposal.
- Eventually, negotiations began. All meetings were recorded with the permission of the attendants in order to keep evidence of the agreements and to the process be as transparent as possible.

Practitioners' Lesson #5 Steps in the negotiation process

- *Be informed about what is desired.*
- *Verify your assumptions.*
- *Take into consideration the point of view of the other party.*
- *Set objectives of cooperation and not confrontation with the counterpart.*
- *Identify critical issues: technical, financial and legal issues.*
- *Select the environment: agenda, place, environment, and people participating.*
- *Establish your strategy and define minimum and maximum levels.*
- *Identify clearly which are the relevant issues in which you can give in, and how far you can go.*
- *Address the needs of your counterpart.*
- *Be patient, persistent, and creative. Listen.*
- *Obtain a win/win agreement.*
- *Record everything in writing through a good contract.*

Source: Solleiro (2009)

To embody the agreements reached in this process of negotiation, a proposal contract was drafted. The negotiating process was relatively simple and it took only three meetings with the company to reach the agreements. In general, the company accepted all the approaches suggested by PROINNOVA, especially under the light of the study of costs that had been made and which was approved by the company in view of the experience the office had in these issues.

Practitioners' Lesson #6

Some recommendations for a successful negotiation:

- *Separate people from the problems.*
- *Focus on needs and interests and not on positions.*
- *Develop options of mutual benefit.*
- *Develop and insist on the use of objective criteria.*
- *Plan and prepare yourself adequately.*
- *Negotiation should be conducted by someone with knowledge and decision-making capacity.*

The key issues included in the licensing contract proposal were:

- a. A preamble with statements that provided a framework for the contract. Of importance in these statements is the inclusion of a clause indicating that "The parties agreed that one of the fundamental objectives that join them to establish this relationship is the final objective of benefitting the national producer of papaya, especially the small and medium-sized producer. Therefore any difference, interpretation or conflict arising in the implementation of this agreement shall be resolved taking into account the national producer's interest". Inclusion of this statement in the contract, which has a very practical application and is not a mere intention of the parties, was not difficult, especially because of the nature of the company with which the negotiation was taking place and its ample social vocation. The practical intention was that in case of doubts about the intentions of the contract, the parties could have a parameter in which they both agreed.
- b. A non-exclusive license grant for a period of six years for the territory of Costa Rica, with an initial payment and later payment of annual royalties upon total sales.
- c. The possibility to review the terms of the contract.
- d. No sub-licensing to be allowed.
- e. The company would have a period of implementation of one year to begin the production of seeds.
- f. The exportation of the seeds to be prohibited, which must be controlled by the company.
- g. The name of the Pococí variety would continue to be used.
- h. The price of the seeds to be defined by both parties and could be reviewed upon request from any of the parties.
- i. UCR-INTA to maintain the right to continue using the seed for research and even conduct tests with the producers who collaborated in the whole process.
- j. The existence of a confidentiality clause, that contemplates the review of the accounting information and other clauses which are typical of a licensing agreement.

- k. The company to receive all the necessary technical support for the production of seeds, but not allowed to do research with the parental lines of the variety.
- l. Finally, an important clause related to the provision of seeds to large companies: "Given that the main objective of this project is to favor the national producers, especially the small and medium-size producers and to consolidate a national papaya market for local papaya growers, with a future exportation market goal, the company is solely authorized to sell seeds to domestic producers, whether these are individuals, or organized groups or companies with solely national capital. Where there is a request to purchase seeds from producers not falling within these classifications, the company shall refer them directly to the UCR-INTA, which shall decide together with the company how to proceed to meet this demand."

Practitioners' Lesson #7

It may be that when analyzing these conditions there will be positions that support or disagree with them. The important issue here is to emphasize that everything is on the table for the negotiation and signing of the contracts. If the parties have concerns and resolved them by negotiating, this should be showed in the contracts. Hence the care that must be exercised when dealing with templates, forms or pre-planned templates that do not provide opportunity for creativity and negotiation. There are no good or bad contracts; there are only agreements, and if the parties are satisfied with them then the contract will be a success.

3.7 The Board of Directors and a skeptical legal department before a determined partner

There is no doubt that co-ownerships are not easy to manage. Along the implementation process it was obvious that, despite the fact that agreements were signed and situations and circumstances were anticipated, such measures did not achieved reassurances to all parties for a comfortable level of acceptance. In the middle of the negotiation process with the company and pending only the draft contract details, the director of PROINNOVA was asked to appear again before the INTA Board of Directors. The PROINNOVA Director was requested to make a statement on the process conducted to date, the selection of the company, and details of the negotiations that had been conducted.

There were two circumstances that made INTA make this request and thus slightly change the landscape of what was agreed. First, some members of the INTA Board of Directors had been newly incorporated. New members did not know the licensing and negotiations processes accomplished to date. This obviously meant a setback. Secondly, there had recently been several political events of corruption in high levels of government that were having an impact on the political landscape in the country. A new law on illicit enrichment had been promulgated and members of public institutions' Boards were very careful in their decisions. Fear of having to face criminal proceedings due to the possibility of making illegal actions or decisions due to ignorance of incomplete knowledge of existing law obstructed further decision-making in the public sector.

The initial fears about the legitimacy of INTA to license varieties increased. Legal studies were requested and some legal advisers did not agree on the legality of the process and questioned the ability of INTA to carry it out. The Legal Department of UCR, by request of PROINNOVA, conducted a study of the legal status of INTA, concluding that licensing was a normal activity of the institution. Furthermore, new legal studies and technical studies were requested, and still the members of the Board of Directors of INTA did not feel comfortable with the licensing process.

Thus, despite the fact that an agreement between the parties had already been signed, doubts began to emerge regarding the extents of the co-ownership. It should be taken into account that the issue of protection of varieties and their licensing was not well known and accepted by INTA and also the issue of intellectual property protection is generally complex to raise in the country in general, especially in public institutions, with little or no experience.

This later situation was in complete opposition to the attitude at the UCR that was already used to these processes and even had accumulated some experience. In a way, what happened was that one of the parties, instead of pushing forward, was delaying the other most advanced party.

Practitioner's Lesson #8

An institution having a nonprofit purpose or that produces or develops public goods is not prevented from using intellectual property rights as a tool to accomplish its mission. There is no contradiction between the protection of intellectual property and the mission, or the public interest, of an organization.

The concept of public good, as a good that is developed by an organization with an eminent public interest, should be counterbalanced by the concept of goods in the public domain, which refers to any information or material that is not protected by an intellectual property right or that it has expired. Goods in the public domain are accessible to the public without the need for any authorization nor should there be restrictive conditions for its use. An example can be found in music or books for which their term to be protected by the law has expired.

(Source: Delpiazzo and Silva, 2008)

At this point, it became obvious that it was not clear to INTA how the concept of shared property or co-ownership in the contract could be implemented. Both the UCR and INTA had different levels of organization development in the IP topic, and doubts emerged as whether INTA could produce and commercialize the seeds by itself. This would definitely affect the transfer process to a third party. Also, rather than speaking of a UCR-INTA licensing with the chosen company, there was a growing preference to establish a UCR-chosen company license agreement. There was total clarity at this point that the UCR had no problems with the licensing process. Therefore it was agreed amongst both parties that the INTA could produce and sell the variety, but the price should be consistent with the market, in such a way that it did not cause injury to future licensees or to represent an unfair competition for them.

The need for an addendum to the initial cooperation agreement, already signed by the parties, to clarify these aspects, was decided. The addendum sets the clarification of the scope of the co-ownership issue. It was established that both parties could use the technology and the knowledge developed around the development of the variety either together or separately. The agreement considered that both parties could produce and market directly the seeds without prejudice to other transfer mechanisms. Thus, the UCR could continue with the licensing process and INTA could also continue producing the seeds and giving them to the producers.

In practice, it became obvious that these agreement modifications and clarifications forced changing the terms of the license while changing the agreement conditions for the licensee. INTA feared a lack of understanding, on the part of producers and other areas in the country towards the licensing process, especially as the licensing agreement would represent a change in a production context where producers were used to obtain the local varieties seeds for free. With the new agreements, it was guaranteed that if any sector protested the terms of the agreement or its implementation, there were ways to adequately guide resolution amongst parties. As already mentioned, and will be seen below, such fears were prophetic.

3.8 The complications of a three-party negotiation

The events described previously delayed the process one year. The company, after such a long time and after becoming aware of the agreement shortcomings, was no longer so enthusiastic in obtaining a license. Doubts about INTA began to worry the company too, but they agreed to sign only with the UCR. Their concern centered on the production of seed by INTA, in spite of the guarantees agreed in the agreement addendum. These guarantees were reflected in further changes made to the license agreement.

The UCR was still determined to pursue the licensing process as it continued to be convinced of its benefits. The UCR believed that licensing established a new form of relationship with the productive sector, and thus was empowered by taking advantage of the know-how, the technologies and the products that were being developed, without having to participate in the commercialization of the papaya seed. In this process, the UCR would be able to obtain resources and time that would allow remaining at the frontier of knowledge in the field. This whole process was based on the conviction that, in order to meet its public purpose and its mission as a University, namely to supply the producers of papaya with seeds of good quality and new technologies, the licensing was the best means.

UCR is not a seed-producing company. To divert human resources and materials for the production of seeds to supply a claimant market is not within the mission of the institution and cannot necessarily do it with the required capacity and effectiveness. The UCR preferred to use those resources in the continuation of research and thereby ensure producers with the supply of more and better seeds. The plans that were made about this licensing process covered strategies for the use of certain varieties for the local market and others for the export market. The same also applied to the transnational companies that, at some point in time were also interested in the variety.

There was a certain urgency in licensing due to the pressure exerted by farmers for more seed, there also existed the possibility that competing seeds that could be introduced to the local market and also the need also to take advantage of the window of opportunity for the export of fruit. However, all these arguments and explanations were useless; the negotiation with the company was continued but with many difficulties. In spite of that, agreements were reached with them in the terms already mentioned in the contract. But the problems were not over.

3.9 The tragedy of four-party negotiations

As mentioned above, at the beginning of the project there were some cooperation alliances with the papaya producers. Some of them were independent producers, but others were clustered in producer organizations. One of these strong organizations of producers, located in the region where the project was carried out, was interested in the development of a variety of papaya suitable for industrial use. However, the limitations of the project and above all, the production of seeds of the Pococí variety made it impossible to continue with the research related to the other variety type. The later organization heard about the licensing process and the fact that it had been awarded to a company. They really did not know what variety it was. The lack of information caused considerable problems in this process.

This organization did not agree with the licensing process, objected the company, and began to lobby politically in order to enforce its concerns. It did not contact the UCR or INTA directly. The first thing they argued was the fact that they were not taken into account in the licensing process, and claimed that they wanted to be licensees. The fears of the first Board of Directors of the INTA were confirmed. PROINNOVA agreed to meet with the specific producer organization questioning the existing licensing process in order to study in depth their concerns on the production of the seeds of the Pococí variety and of the industrial variety as well, and to inform them about the requirements and procedures to follow for the production of the seed of a papaya variety.

However, before the meeting took place, the protests had reached the level of the Legislative Assembly and the Minister of Agriculture. The Presidency of the UCR and the Board of INTA were called to account for this dilemma by high authorities. This is when the public bidding and the transparency of the process became an indispensable ally to justify the actions of two emblematic institutions in the country that had no other objective than to benefit the papaya producers. Explanations were given, the whole process was shown and it was demonstrated that the organization did not participate in the public offer as a bidder. Furthermore, it was verified that the process was completely transparent and the names of the institutions were not questioned. The process was considered adequate, attached to the standards, and to the possibilities and limitations of the country.

A meeting with the organization was held and all doubts were clarified. They were informed about the process that was followed and even raised the possibility of granting a license either for the Pococí papaya variety or for any special variety that could be granted on a basis of exclusiveness in order to generate a possible geographical indication.

To settle this impasse, the options were laid out. It was still possible to grant a license since the terms with the company could be reconsidered and a strategy that would also be suitable to them could be found. The University needed to come through unscathed and all possible creative solutions was considered. The possibility for the company of becoming a licensee was also explained. The option that the organization could become a licensee was in practice and all probabilities a solid option. Actually, the producer organization did not have the capacity or the infrastructure to engage in a process of seed production; nor did it have the financial resources or knowledge to get started in this business. The first intentions faded away when they realized that more than willingness was required to undertake this objective. At the end the producers were satisfied with the explanations.

Practitioner's Lesson #9

The lesson learned from the sequence of events is that PROINNOVA did not consider farmers - as end-users of the seed, as well as other stakeholders in the licensing process. The role that papaya producers played was over-estimated and at the end, their reaction was a product of lack of information and from having felt excluded. The lack of information and exclusion were the detonators of a conflict that never should have existed. If producers had been duly informed and included in the process, this episode could have been avoided. There are many and various ways in which producers may have been incorporated. They should have been taken into account, given their experience and their opinion, which were facts considered in the research process. Unfortunately they were not taken into account in the licensing process.

3.10 The change in conditions and the true reason for negotiations breakdown

However, by then the damage to the licensing process was done. There had been too many questions by external actors and perhaps too many explanations had been given. Many people had given their opinion and thus a long time period had passed. With all these developments, the licensee company contacted PROINNOVA and requested to reconsider the licensing agreement. Without having a formal meeting, the company sent the office a series of major changes to the initially agreed conditions. They wanted changes in the royalties, in the price controls, and other minor changes.

Upon realizing what the situation was, PROINNOVA decided to meet personally with the company and began negotiations again. After several hours of discussion, explanations and negotiations they agreed to the initial conditions. The company expressed its willingness to sign the contract, but there was a sense of un-raised negative issues. During the meeting, a climate of dissatisfaction and concern was not clearly spelled out. A perception grew on the part of PROINNOVA that something was not being laid down on the table. The director of PROINNOVA had a feeling that the company did not actually want to sign and thus expressed that perception to the other party. Finally, company officials decided to clearly raise their concerns about the whole negotiation. The problem that developed with the producer organization was a very important factor for them. The producers in the region are also customers in other areas of their business and the dissatisfaction with the license can result in being very expensive in terms of business.

PROINNOVA argued that UCR was not forcing them to sign the agreement and that their insistence in returning to the original conditions related to the need to make it clear that the contract was not signed due to other external reasons, not because the original conditions agreed upon were not fair or were unclear. PROINNOVA's perception was that if, the deal fails, there was a chance that there will be doubts about the fairness of the negotiation and great damage would have been done to the institution. That possibility had to be avoided upfront. Clearing this up, they both literally shook hands and left the possibility for business in the future open. The license would not be signed in the end.

3.11 An unexpected outcome and three unsuccessful years

The previous sections describe how at the end of three years invested in a licensing process, the licensing process for the UCR/INTA papaya variety had not been successful. PROINNOVA as an organization, grew increasingly restless, for not reaching an agreement in due time. The existing view at the PROINNOVA office was that of frustration and a sense of wasted time and resources which started to permeate at the organization. The pervading perceptions and even morale affecting issues occurred in spite of having a previous clear understanding in the past that these processes are not always successful.

The UCR and INTA decided to continue producing seed and not to license the papaya variety. To fulfill the existing commitment of continue providing seeds to producers, the UCR invested approximately US\$ 10,000.00 for the required greenhouses and other facilities for seed production. The aforementioned amount came out of the limited budget of PROINNOVA. The UCR continued providing financial support to the project out of its already limited resources. The INTA did not have to make as much investment for seed production, limiting its role therefore to sell papaya seeds merely through its existing physical presence in important production areas.

Important is to note that papaya seeds are sold, not given for free to farmers which was the intention in PROINNOVA's original plans for technology transfer. The only difference in the resulting scenario from the one originally planned by PROINNOVA, is that the seed production is more expensive for UCR and INTA organizations, given their special characteristics of research institutions, rather than that of a private (or public) sector company focusing on seed production as its core business. The later scenario of higher than planned production costs for papaya seeds is still the current situation in Costa Rica.

3.12 An aggressive environment in combination with an unfortunate political climate

The outcome described in the previous section would have been in itself an unfortunate –and undesirable– outcome in itself for PROINNOVA technology transfer efforts. However, the political events that followed in the political history of Costa Rica may give credence to the existence of an ungrateful providence. The undesirable outcome of the UCR producing papaya seeds at a higher

cost than what a private company and not being successful in licensing the papaya variety were made in many ways worse by the political developments described next.

For many years, Costa Rica and the rest of countries in Central America entered into a negotiation process for a Free Trade Agreement (FTA) with the United States. The negotiation effort was subsequently joined by the Dominican Republic. The FTA negotiations culminated in 2004 (COMEX 2004), when the process of signature and ratification of the FTA started within the Costa Rican Government. Under Costa Rican laws, the resulting FTA had to be approved by the Legislative Assembly; however, there was much reluctance to do so. Instead of being a straightforward ratification process by the Costa Rican Congress, political forces opposed to the FTA, were successful in the establishment of a referendum asking the general population if the trade agreement should be ratified. The views were highly divided. The country was divided between the SI (YES) group and the NO group.

All contents of the Agreement began to be publicly discussed and the two groups with conflicting positions increased efforts in trying to convince the Costa Rican citizens to cast a vote in favor of their political views. Many themes were questioned and some of the issues discussed in public forums were not necessarily discussed properly or with objective criteria. The issue of intellectual property did not escape the publics' scrutiny and was one of the most questioned topics. The plant variety protection theme was especially questioned in public and the NO group deemed particularly a very negative outcome that Costa Rica had committed to the Free Trade Agreement that would require enacting a law consistent with the guidelines of the 1991 UPOV agreement for plant variety protection. Opinions at the UCR were equally divided, similarly to the rest of the country. Farmers were used as an example of how bad the outcomes would be for the country by signing the FTA. The public referendum to decide on the YES/NO was carried out in 2007.

During the public discussion of the role of IP and the FTA, before and after the referendum, many terms and issues were not well discussed or in some cases, there was a lot of confusion. Several issues clearly evident in the discussion of this case study were not well understood in those discussions. For example, the final purpose of any licensing process is to provide producers with improved varieties. Having access, however, to improved varieties has a cost. An investment in research and development must be done and perhaps eventually repaid from fees and/or the social benefits derived from varieties' adoption.

In the specific of the papaya variety development, the R&D project cost UCR-INTA more than one hundred thousand dollars at the time that licensing was promoted. While it is true that the improved papaya variety seeds have an additional cost to producers, such cost is reverted to the producer through more and better production, larger markets, expanded options and other benefits. Furthermore, and contrary to allegations by many groups opposing IP protection and varietal licensing, producers are not obligated to buy protected seed. Producers can still use traditional varieties, if they desire. If producers, however, want to have a larger yields and production, spend less on productive inputs, and have the potential of accessing new markets, they have the option of purchasing improved seeds. If producers make the necessary estimations, they may choose improved papaya varieties as a productive and financially better option that meets their needs. Unfortunately, the later point was never understood and is still reason for arguments in Costa Rica. An important lesson though in any developing country is that producers need to continue having production options. In this sense, the State has to guarantee a system in which there is always a balance and that the farmers always have access to a portfolio of varieties at fair prices. In the current case study, an examination of the draft contract documents shows that the companies and organizations involved guaranteed this balance.

Given the explosive political environment at the time, PROINNOVA could only wonder what would have happened at the time if the UCR had insisted on licensing the papaya variety seed. For PROINNOVA, it was obvious that in the ongoing conflictive political context, both the SI and the NO groups had used the papaya variety case as a way to buttress their own positions. All actors in the licensing process including the private companies involved would not have withstood the pressure

accumulated against them and the scandal would have damaged past, present, and future efforts made by UCR in technology transfer. Fortunately, as the license had not been signed and producers were still receiving papaya seeds, PROINNOVA and the private company were able to remain out of the ongoing public discussions, that eventually turned unproductive and which had escaped out of the technical sphere, and responded mainly to antagonistic political positions unable to hear each other.

In the end, the outcome of all of the activities done in the licensing process seems like a loss of three years of effort. However, the knowledge and experience gained during the “failed” licensing process will be put to better use in the future in licensing and technology transfer by the UCR. This applies not only to licensing of plant varieties but to the future relationships between the university and the private sector. Furthermore, as described in the next section, a spinoff company that would produce and sell seeds has already occurred, which in essence becomes another positive outcome from the failed licensing process. So what seemed like a failed process has actually yielded a lot of direct and indirect benefits. In the end, the protection of intellectual property is just a tool supporting innovation. Innovation in the end supports overall goal which, undoubtedly is, sustainable and fair development.

3.13 The future of a seed who is to be replaced by her sisters

To further draw lessons from the licensing process, it is important to analyze what has happened during the past two years since the last event in the licensing process of licensing the papaya hybrid seed. Initially, it was mentioned that one of the objectives of the licensing was to gain time by using resources that were being used in the production of the Pococí hybrid to further develop other varieties that were in the pipeline. Fortunately, while still producing the Pococí hybrid seed, researchers did continue working closely together and they now envisage that, within a year from now, they may be able to release a new variety even better than the Pococí hybrid. However, it is clear that the resulting process has been slower and more expensive than would have been if the licensing had taken place.

Given the demand for seeds driven by the success obtained with the Pococí papaya variety, papaya production areas have been changing to the cultivation of the Pococí hybrid. Production areas have increased. Adoption rate for the Pococí variety is at least 60% of the total planted area, while incorporation of 25% of new small and medium-size producers compared to the total number of producers before adoption. These outcomes show the high acceptance level of the Pococí variety, while providing indications that producers are willing to pay a price for the seed. Those producers who have benefitted most are the small and medium-sized Costa Rican producers despite the fact that the licensing was not completed. The UCR and PROINNOVA are rightly proud of this outcome.

As an unanticipated side business, a market for the sale of papaya seedlings has opened and a graduate from the UCR has started a small company around the newly developed seed niche. This induced the creation of one of the first spin-off companies in UCR which may in the future become a licensee more accepted by the producers.

These developments have brought the possibility of a bright future, thus again opening the door to licensing and the transfer of newer varieties, thus opening the possibility of having more planting areas and new producers. This is a possibility that has again invigorated PROINNOVA to implement its mission, despite that doubts persist on the issue of seed exports and the possibility of access by transnational companies. The political arena is no longer as convulsive as during the FTA discussions, in fact the country now has a plant variety protection act. These developments allow the acquisition of more expertise to address the challenges that the future holds and thus opening the possibility of a more focused and informed discussion of issues.

4. Conclusions and Recommendations

This case study aimed at showing an unsuccessful experience licensing a variety of papaya jointly developed by researchers of the University of Costa Rica (UCR) and the National Institute of Agricultural Technology (INTA).

An account of the facts in this case study, showed the process followed by the Office of Knowledge Management and Transfer of the University of Costa Rica (PROINNOVA) in its quest to license a papaya hybrid variety to a private company. The private company was selected following a professional and transparent process.

One of the important objectives of the licensing process was that both the UCR and INTA would delegate the production of seeds to a company with experience and a good distribution network to ensure diffusion to a broad range of producers. Furthermore, the license contract was made to consider both UCR and INTA serious commitment to safeguard the interests of small and medium-sized national producers. The licensing would allow researchers to develop more and better varieties for the producers themselves in the future.

Within both the UCR and INTA, there was fear that a multinational company could take possession of the papaya variety seeds and then proceed to control the papaya market, especially export flows. The issue of multinational companies and their potential impact on the papaya sector was considered in the development of the licensing process since its beginning. Implementing both institutions commitment of favoring national small and medium-sized farmers put them at a decision crossroad in the licensing process. The institutions were at a crossroads, since doing business with the transnational companies can bring a high monetary return but can have a negative consequence to national farmers if the multinational is empowered to monopolize a market through innovation.

A general conclusion resulting from the experience gained in the licensing process of the Pococí papaya variety, is that, in a developing country with low development levels in the field of intellectual property, including its management and licensing processes, combined with a volatile and politically sensitive agricultural sector, such as that of Costa Rica, seed licensing needs to be considered different than the licensing process for other products or technologies.

Despite the fact that PROINNOVA followed a process that may be considered best practice, meaning a process committed to practice standards of management and technology transfer; external issues prevented granting the license. The fact that the UCR/INTA counterparts had not experience in IP issues and licensing caused an unnecessary delay. The signing of agreements did not ensure an adequate climate for the licensing process.

The experience acquired by the University of Costa Rica can be used by other institutions in developing countries in dealing with IP management as a very good example of how the licensing process can be conducted and the types of issues the licensing process underwent through in a developing country setting. From the standpoint of a practitioner, it is not as important if a license agreement was reached or not, the important thing is to learn from the process and showcase the experience gained in the licensing process. The causes of failure have nothing to do with the ability of the actors involved in the licensing negotiations, rather had much to do with not involving all the stakeholders in the process from the start.

This case study is a humble contribution of the University of Costa Rica to technology managers in developing countries who may confront these types of issues due a volatile political environment and the lack of understanding of intellectual property management in their countries.

From the background information, case study history and discussion; the following recommendations can be made which can be valuable for practitioners in Costa Rica and in other developing countries.

- a. A public R&D organization needs to understand that its mission or public purpose does not prevent it from using intellectual property protection as a tool for achieving its public purpose.
- b. A public R&D organization needs to have proper management of research processes outputs and outcomes. The organization should have an office or focal point to deal with these issues, and a clear policy that defines the appropriation and/or ownership of benefit streams derived from R&D outputs.
- c. All R&D joint collaborative relationships with counterparts from both the public and the private sector should be embodied in existing contracts where the result (output) ownership is clearly defined;
- d. Researchers from the institution, as well as their managers and the authorities must be aware and trained on the subjects of knowledge protection and management so that they understand and are able to foresee needs and issues to implement licensing and other IP related agreements.
- e. A culture of acceptance to these processes should be encouraged within the institution and its counterparts.
- f. Once the specialized staff or office is in place and functioning, the authorities of the institution must rely on such personnel and allow them to work in a flexible and expedient manner because in licensing processes, time and the way in which decisions are made are crucial matters.
- g. In R&D institutions, intellectual property management offices must be constantly renewing and building capacity in order to have the necessary knowledge and tools to address complex processes. An adequate climate for creativity and the generation of new ideas should be encouraged to resolve unexpected situations.
- h. The external environment, the political process, and relevant stakeholders, should all be factors to take into account during intellectual property licensing processes. This issue may be of particular interest for those innovations coming from a public sector institution.
- i. Countries with little experience and culture in IP issues should not insist in setting protection and licensing processes that generate high resistance, given that the important issue is to build for the future by disseminating innovations. Therefore, it is necessary that various stakeholders consider the process as timely and pertinent, for the process to be ultimately successful.

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Background on Papaya (*Carica papaya*)

The papaya fruit is native to the forests in Southern Mexico and Central America. The papaya is grown today in most countries of the inter-tropical area of the world. The plant has a limbless trunk with a height of between 2 and 10 m. with branches having palm-shaped foliage. The flowers are developed in the leaf axils. The fruit is oblong in shape, can be yellow, orange or pink colored and weighs up to 12 kg. However, the market trend has led breeders to seek smaller papayas, which often do not weigh more than 500 or 600 g from small, highly productive plants, generally destined for exportation (OECD, 2003). Another byproduct of the plant is the sap extract that has a milky consistency containing *papaina*, a very useful enzyme employed as meat tenderizer.

The species is dioecious in wild populations, meaning that there are plants that produce only male flowers and plants that produce only female flowers; however, hermaphroditic plants exist in cultivated varieties, where there are flowers with both sexes. This being a desirable characteristic in a commercial plantation, since all plants are therefore productive. Papaya plants always having flowers and fruits at the same time are considered one of the most productive plants in relation to their size.

To obtain seeds for a 100-hectare crop, approximately 25 papaya trees are required, which will yield approximately 871 grams of seeds; the human effort needed is equivalent to 475 man-hours. This human resource of about 475 hours includes planting, pollination, maintenance and care, harvesting, and processing. Also, at least four-1200 m² of greenhouse area are required for the production of female plants, and two greenhouses for the production of male plants, a spraying pump, seed extraction equipment, irrigation machinery, a seed dryer and grader, a bagger, as well as other different agricultural materials.

Table 1 Papaya area and production by major production countries

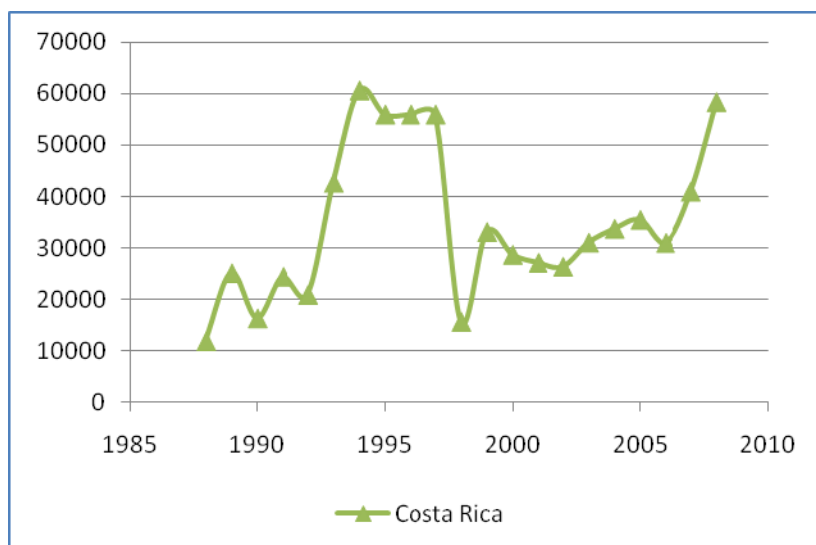
Country	Area Harvested (ha, average 2004-2008)	Percent Share	Production (tons, average 2004-2008)	Percent Share
Brazil	35,037	9.3%	1,759,069	20.0%
Mexico	19,190	5.1%	770,678	8.8%
Kenya	8,000	2.1%	86,200	1.0%
Dom. Rep.	2,231	0.6%	23,000	0.3%
Bolivia	2,188	0.6%	23,080	0.3%
South Africa	1,720	0.5%	17,284	0.2
Paraguay	976	0.3%	10,360	0.1%
Costa Rica	685	0.2%	39,984	0.5%
USA	564	0.1%	14,870	0.2%
Israel	510	0.1	199	0.0%
World +	377,866	1	8,776,016	100.00%

Table 1 introduces the relative area and production for papayas in Costa Rica and major global producers. Even though Costa Rica only has 0.2% of the total area planted to papayas, total

papaya production is 0.5%. This reflects a relatively high yield compared to other countries in the world, but this results masks significant variability in terms of production and yields.

Figure 1 introduces papaya production in Costa Rica from 1987 through 2008. Papaya production reached a peak in 1994 through 1997 decreasing significantly in 1998. Production is slowly recuperating, almost reaching in 2009 its peak production.

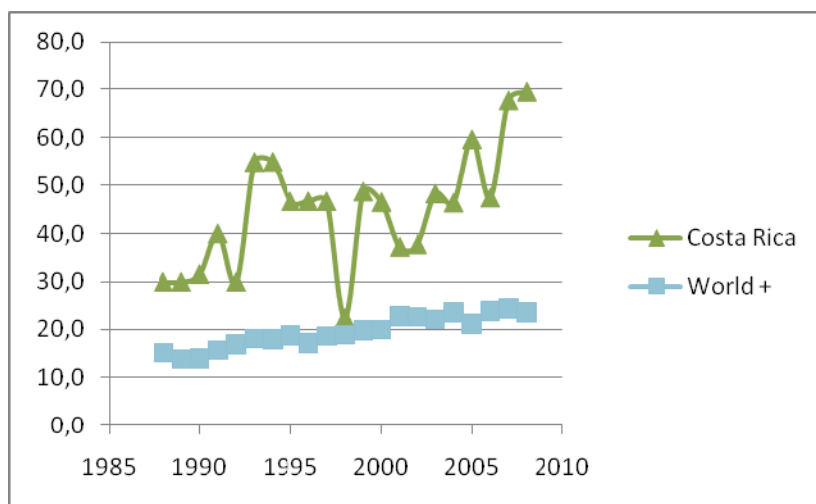
Figure 1 Papaya production in Costa Rica (tons)



Source: FAOSTAT (2010)

Figure 2 introduces a comparison between papaya yields in Costa Rica and the world average. Costa Rica has a higher yield than the world average; however, yields in Costa Rica tend to fluctuate significantly. Yield variability has several potential causes, none which has been extensively studied to date in Costa Rica.

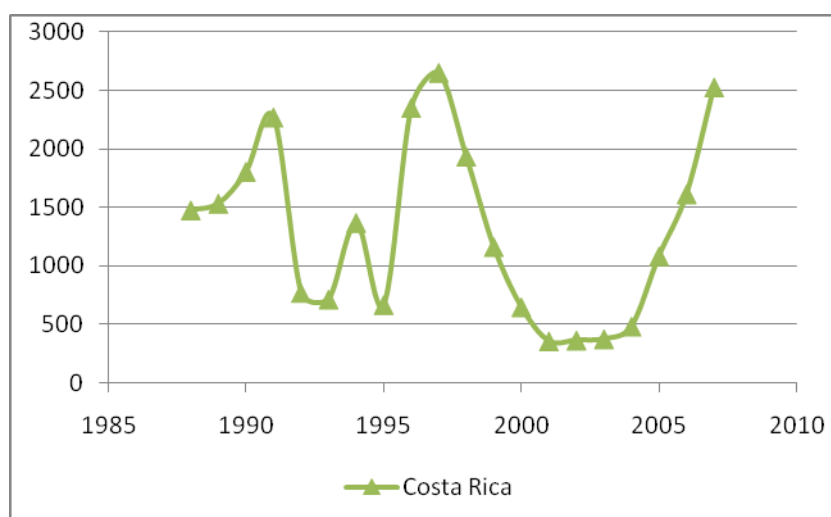
Figure 2 Comparison between Costa Rica and World Average Yields (tons/ha)



Source: FAOSTAT (2010)

Yield fluctuations can have an impact on area cultivated with papayas. Although not shown here, this is indeed the case for Costa Rica. The value of Costa Rica papaya exports (See figure 3) have also fluctuated over time, in part following papaya production in the country. This is not surprising as there is some sense in Costa Rica of the need to stabilize production, quality and to start developing domestic and export markets in a consistent manner.

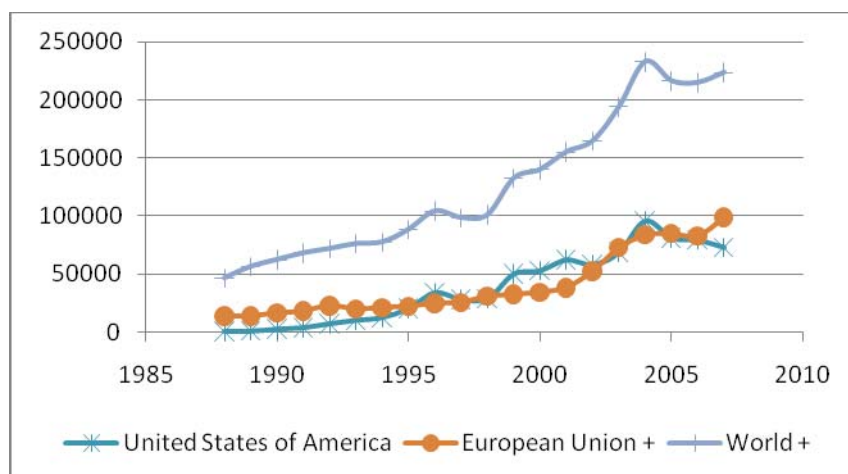
Figure 3 Value of Costa Rica's papaya exports (1,000 US\$)



Source: FAOSTAT (2010)

Certainly the value of papayas imports has been increasing over time. As seen in Figure 4, the value of imports for the world, USA and the European Union has been increasing over time. This is the results of increased fresh fruit and other consumption uses, but also there may have been a price effect where world prices may have been increasing. This represents initial indications of potentially attractive market to Costa Rican producers.

Figure 4 Value of World, USA and European Union Papaya imports (1,000 US\$)



Source: FAOSTAT (2010)

An example of the Pococí papaya variety diffusion in domestic and international markets –Experiences from organized small producers entering into commercialization alliance

The Papaya hybrid Pococí – A Papaya from Costa Rica

The papaya hybrid Pococí, a 100% costarrican variety, also known as "Perfecta", is the result of research conducted by two costarrican researchers, Eric Mora, from the University of Costa Rica and Antonio Bogantes, from the National Institute of Agricultural Technology (INTA) belonging to the Ministry of Agriculture.



After its successful introduction in the Canadian market, cultivation of this unique papaya variety has increased and several cultivation projects are currently entering production.

This is the case of the community development project "Centro Agrícola Cantonal de Guácimo" which gathered 11 small producers in the region. Under the supervision and coordination of the Center and with support from INTA and the University of Costa Rica, these producers followed the technological package developed by costarrican scientists and are now harvesting the fruits of their efforts.

Characteristics of the Pococí hybrid include medium size fruit of approximately 1 to 2 kg. (Average is 1.5 kg.), an internal red color fruit, and desirable flavor and aroma. The fruit is characterized by a 9 to 11 Brix degree units. External color is yellow, sometimes with numerous small green dots.

The “Centro Agrícola Cantonal de Guacimo” is leading the post-harvest process in its own packing plant, creating over 20 direct labor positions. Furthermore, it has organized a small group of women who are directly responsible for managing and implementing daily operations in a plant nursery that produces seed for sale to other producers, as well as, sell to its members.

Production commercialization for this alliance is channeled by “Empresa Internacional de Comercio EICSA SA*” who also supervises quality control and selection of best products for the export market. The company expectation is to penetrate the European market in the near future, provided we manage to secure fast and safe sea transportation.

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