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O Posto Agropecuário de Ijuí e a modernização da agricultura

The Ijuí Agricultural Station and the modernization of agriculture

El Puesto Agropecuario de Ijuí y la modernización de la agricultura

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Abstract: This paper addresses the role of the Ijuí Agricultural Station, implemented by the Ministry of Agriculture in the 1940s to promote the agricultural modernization of the northwest region of Rio Grande do Sul, and which has stood out in agricultural history because of its development of wheat and soybeans crops. The implementation period of this institution promoting the spread of technologies occurred before the Green Revolution in southern Brazil and meant an important collaboration for the later development of this revolution. We analyzed the contents of documents archived in the Diretor Pestana Anthropological Museum, produced by the director of the Agricultural Station, in addition to articles published in the newspaper *Correio Serrano*. The analysis' perspective is Agrarian History and Environmental History, with emphasis on the role of the State as an agent for the spread of new technologies and on the social-environmental impacts resulting from the agricultural modernization process in the period from 1940 to 1976.
Keywords: Agrarian History. Environmental History. Green Revolution. Ijuí Agricultural Station.

Resumo: o artigo trata do papel do Posto Agropecuário de Ijuí, implantado pelo Ministério da Agricultura na década de 1940 para fomentar a modernização agrícola na região noroeste do Rio Grande do Sul, a qual se destacou na história da agricultura pelo desenvolvimento das lavouras de trigo e soja. O período de instalação dessa instituição de difusão de tecnologias precede a Revolução Verde no sul do Brasil e significou uma importante colaboração para o posterior desenvolvimento dessa. Interpretamos o conteúdo de documentos arquivados no Museu Antropológico Diretor Pestana, produzidos pelo diretor do Posto Agropecuário e artigos publicados no jornal *Correio Serrano*. A perspectiva da análise é da história agrária e da história ambiental, com ênfase no papel do Estado como agente de difusão de novas tecnologias e nos impactos socioambientais decorrentes do processo de modernização da agricultura no período de 1940 a 1976.
Palavras-chave: História agrária. História ambiental. Revolução Verde. Posto Agropecuário de Ijuí.

Resumen: el artículo trata del papel del Puesto Agropecuario de Ijuí, implantado por el Ministerio de la Agricultura en la década de 1940 para fomentar la modernización agrícola en la región noroeste del Rio Grande del Sur, la cual se destacó en la historia de la agricultura por el desarrollo de los cultivos de trigo y soja. El periodo de instalación de esa institución de difusión de tecnologías precede la Revolución Verde en el sur de Brasil y significó una importante colaboración para el posterior desarrollo de la revolución. Interpretamos el contenido de documentos archivados en el Museo Antropológico Director Pestana, producidos por el director del Puesto Agropecuario y artículos publicados en el periódico *Correio Serrano*. La perspectiva del análisis es desde la historia agraria y desde la historia ambiental, con énfasis en el papel del Estado como agente de difusión de nuevas tecnologías y en los impactos socioambientales resultantes del proceso de modernización de la agricultura entre el período de 1940 a 1976.
Palabras claves: Historia agraria. Historia ambiental. Revolución Verde. Puesto Agropecuario de Ijuí.

Introduction

The Ijuí Agricultural Station in Rio Grande do Sul was one of the technology promotion institutions operating between the 1940s and 1970s, the period when the Green Revolution took place. The origins of this institution date back to earlier decades, however, when the agricultural practices used by growers were facing severe criticism of a cultural, economic and environmental criticisms. This text addresses these cultivation systems that were criticized by memorialists and local authorities and which required the creation of experimentation and research centers, among other actions. It is in this context that the Agricultural Station (*Posto Agropecuário*) is created as successor of the Permanent Cooperation Field (*Campo de Cooperação Permanente*, CCP). We then analyzed the actions taken by the Station to solve the problems and its links with other institutions acting in the region.

The documentation of the Station can be mostly found in the archives of the Diretor Pestana Anthropological Museum in Ijuí (*Museu Antropológico Diretor Pestana de Ijuí*, MADP). From its foundation until its dissolution, the head of the station wrote a life history that blends with that of the institution itself, constituting an important witness account of the activities. The interpretation of this documentation is based on classical studies of agrarian history and environmental history and serves as a reference to understand the environmental impacts and to investigate the circumstances in which the traditional practices started to be questioned and considered inviable.

Specific studies on agricultural stations are scarce. According to Peixoto (2009), more than 200 stations were created by the Ministry of Agriculture, but they "only served few and privileged growers, according to their influence in local politics. In general, the stations were poorly managed, with an excess of employees, and as such they were short-lived" (2009, p. 20).[3] In the 1960s, the last stations were donated to municipalities, cooperatives and private companies (OLINGER, 1996 apud PEIXOTO, 2009, p. 20). The case of the Ijuí Agricultural Station is different, since we found no evidence of political favors to privileged growers and its existence extends from 1944, the creation year of the Permanent Cooperation Field, until the end of 1971, when it was transferred by the Ministry of Agriculture to the Assis Brasil Municipal Education Institute (*Instituto Municipal de Ensino Assis Brasil*, IMEAB), a technical school maintained by the municipality of Ijuí. The agreement with the city didn't bear fruit and, in 1976, the station was passed as a free loan to the Serrana Regional Wheat Cooperative (*Cooperativa Regional Tritícola Serrana*, COTRIJUI). In 1994, the Cooperative relinquished

the premises and the establishment was taken over by Unijuí, a local private university, also as a free loan.

The Station: Origins

The Ijuí Agricultural Station has its origin in the Permanent Cooperation Field of the 4th Agricultural Zone of Rio Grande do Sul, established in 1944 in an area of 25 hectares leased by the municipality. The Cooperation Fields were created by the Ministry of Agriculture of the Vargas administration in 1930, in an agreement with the municipal governments to "encourage the employment of agricultural machinery and improve cultivation methods" (BRASIL, 1939, p. 13). The contract stipulated the duration time of the agreement, the cultivated area and the crops to be exploited. The Eurico Dutra administration instituted the Agricultural Stations as replacements of the Permanent Cooperation Fields through a decree in 1947. These stations sought to "directly assist farmers and growers, improving and defending their production" (BRASIL, 1952, p. 88). The stations were also based on agreements between the municipal and federal governments, whereby the municipality would provide the physical structure and the Ministry of Agriculture the team of technicians, staff, machinery and demonstration tools, and the loans to the farmers.

To meet the requirements of this Decree, leaders of the Ijuí municipality made use of the Getúlio Vargas Society for the Experimental Station Campaign (*Sociedade Campanha Pró-Estação Experimental Getúlio Vargas*), created in 1943 in order to raise funds to buy an plot of land. In 1948, the aforementioned society made a donation of 234.5 hectares to the Union in the vicinity of the Conceição river, a tributary of the left bank of the Ijuí river (BRAZIL, 1948). In October of that year, the Ijuí Agricultural Station was officially opened using the equipment of the Cooperation Field and with the same senior technical staff.

The 4th Agricultural Zone of Rio Grande do Sul, located in the northwest of Rio Grande do Sul, with headquarters in Ijuí, included the municipalities of Cruz Alta, Tupanciretã, Palmeira, Iraí, Santo Ângelo and Santa Rosa. Located between 200 and 450 meters above sea level, these lands were originally covered by deciduous seasonal forest, dotted with areas of native grasslands. They are located in a large region of immigration and colonization, based on small properties, with a standard of 25 hectares of forest land. The native pastures were occupied after the beginning of the 19th century with the creation of livestock in medium-sized and large properties.[4]

Other initiatives for the modernization of agriculture, linked to teaching and extension, had been implemented earlier. In 1930, the municipality founded the Model Colony (*Colônia*

Modelo) "in order to teach new farming techniques and introduce new seed varieties and cattle and pig breeds" (CALLAI, 1987, p. 18). This teaching-oriented institution transformed into the *Escola Municipal de Capatazes Rurais Assis Brasil* in 1943. In the introduction of the booklet dedicated to the inauguration of the school, the public instruction director wrote: "When routine is swept from our crops and technique rules the arm of the farmer, men will be swept up by the joy of abundant harvests and bless the creator of agricultural education in the municipality of Ijuí" (LORENZONI, 1943, p. 2).

Agricultural Practices Before the Installation of the Station

The basic justification for the deployment of agricultural research and technological promotion institutions in Brazil assumes a technical backwardness in agriculture and the consequent need to promote technological progress. Since the mid-19th century, at least, recurrent remarks can be found in the press and literature condemning the peasants for using rudimentary cultivation practices and for being averse to innovation. However, as is known, the peasants had sufficient knowledge to produce their favorite crops for hundreds of years, without major problems. In a different way, the discussion about underdevelopment and innovation arose from the creation of numerous scientific institutions in Europe and the United States, which were dedicated to experimentation and the systematization of agronomic knowledge (SLICHER VAN BATH, 1976). Based on this scientific knowledge, regional agriculture began to be questioned by critics and authorities. The first texts produced by the senior management of the Permanent Cooperation Field/ Agriculture Station started from the finding that local farmers used inappropriate practices, with an "abusive use of the soil", causing erosion and depletion of natural fertility.

Numerous texts from chroniclers and local authorities, circulating since the end of the 19th century, made severe judgments of the national farmers[5] and pointed to immigration and colonization with European farmers as solution, who were seen as more qualified to use modern farming practices. These judgments were of an ethnic-cultural nature. Later on, however, it was found that the first and second generation of European settlers, who came to the region after the end of the 19th century, followed the same cultivation system as the traditional farmers (WAIBEL, 1979; ROCHE, 1969).

A comment published in 1884 in the local press, taken here as an example, stated that the farmers of the region "had unhappily lingered in a state of complete abandonment and delay, finding themselves almost entirely reduced to the most shameful misery due to the most crass ignorance regarding the agricultural theories and improvements that have been introduced until

today" (AURORA DA SERRA, 1884, p. 99). In the chronicler's opinion, this situation was a consequence of the ancient soil management practices, inherited from indigenous peoples, based on a system of felling the brush for the cultivation of corn and beans by using ax and fire, which sterilized the land. As a solution, the author proposed the creation of settlement cores with European immigrants, who would supposedly be qualified for agriculture. However, he foresaw and warned that the settlers would cause severe impacts on nature and shortsightedly clear the forest: "In less than half a century, all virgin forests that are a source of pride for this rich region will have disappeared. This is a thoughtlessness of the present generation that will never be forgiven by future generations, and with every reason" (AURORA DA SERRA, 1884, p. 99).

Evaristo Affonso de Castro, a journalist and author of a book published in 1887, described the cultivation technique used by local farmers, with characteristics similar to what he described for other regions of Brazil:

> After felling the bush with an ax or sickle, our farmer lets it dry and then sets it on fire; as soon as the first rains fall, he sows the land, digging into the ground with a stick called *saraquá*, placing in this hole the seed that will bring forth the wheat, which they call *samburá*, and when so done, the land will require no more work, except in the time of harvest (1887, p. 282).

This model of agriculture was compensated by the possibility of land rotation, a secular practice in the region inherited from the indigenous peoples in an area with low population density. This traditional way of burning the forest is widely used around the world as a way of developing agriculture in forest areas, since it requires less labor and less capital, two elements that are scarce in traditional peasant societies. In this sense, is not an irrational method used by ignorant farmers, as the critics stated, but a deliberate strategy to use the natural resources based on land rotation.

This method fits in the model presented by Ester Boserup as a forest fallow or long fallow cultivation system, practiced in forest areas of low demographic density, in which a part of the land can lay fallow for many years without crops until it regains its fertility. The use of fire and cultivation with a stick is a technique that requires little work in relation to intensive methods of cultivation and, from another perspective, the increase of labor-time necessary for the new techniques may not bring worthwhile results. As such, "it may be sound economic reasoning rather than indolence which induces a community of cultivators under the system of long fallow to refuse to abandon fire and axe, when they are offered help to change to plough culture" (BOSERUP, 1965, p. 56).

The specialized bibliography, particularly in agrarian history and environmental history, has demonstrated that the judgments made about the agriculture of traditional peasantry are incorrect in several respects. Agronomists, economists and historians have shown that such systems are perfectly rational and widely employed in the history of humanity (WORSTER, 2003). The farmsteads formed by indigenous peoples and peasants, known in Brazil as *roças de coivara*, fit the model Marcel Mazoyer calls "slash and burn cultivation systems or forest agrarian systems", which have existed in various regions of earth for thousands of years (MAZOYER; ROUDART, 2010, p. 129). It is therefore worth examining under what circumstances the agricultural practices of the peasants from the Ijuí region began to be questioned. To the extent that a significant demographic increase occurs, the farmers will have to develop more intensive systems of production. In this sense, Mazoyer observes that a degradation of fertility and erosion processes occur when the population density increases and deforestation is maintained for a slash-and-burn cultivation system (MAZOYER; ROUDART, 2010, p. 130).

The Immigrant Settlers

The forest agrarian system was viable for centuries in the region inhabited by indigenous peoples and, later, by peasants of Portuguese-Brazilian origin, who maintained an equilibrium between the population and the land available for long-fallow cultivation. However, the situation changed radically with the arrival of thousands of immigrant settlers, drastically reducing the mobility and the space for the native peasants. The settlers operated in a small space, in 25-hectare lots, which made land rotation as it was being done before impossible.

In the 1950s, the geographer Leo Waibel performed a detailed study on the limits of this type of system in the South of Brazil, including the region of the Agricultural Station under study in this text, classifying it according to three key and successive stages of the colonization areas: "primitive land rotation stage", in which the farmer planted subsistence products and raised pigs in a very similar way to the indigenous people; the "improved land rotation system", in which trade was more active and production increased and specialized, but with no fertilization of the land occurring, leading to the depletion of the soil in a few years. The depleted or depleting land was left fallow until it recovered its natural fertility. The third stage, the "crop rotation system combined with cattle breeding", was little used due to the limits imposed by the small size of the rural lots (WAIBEL, 1979, p. 253-254).

Diagnosis of the Senior Management of the Cooperation Field/Agricultural Station

In 1945, the agricultural engineer Hilnon Correa Leite took over the direction of the Permanent Cooperation Field and performed a diagnosis of the local agriculture similar to what the chroniclers had been writing. In his book, there is a section entitled "The type of agriculture I found", in which he discusses the agricultural practices of the settlers and describes the slash-and-burn system in detail. He noted that the settlers learned their techniques from the native (*caboclo*) peasants, who had inherited their practices from indigenous peoples, which were seen as alternative at the beginning of colonization (LEITE, 2004, p. 38).

In a report sent to the head of the Agricultural Promotion Section of Rio Grande do Sul in 1941, he stated that from the agricultural point of view, the region was one of the richest and most prosperous of the state, with a climate and soil suitable for mixed cropping. However, he mentioned that in some municipalities

> the irrational agricultural practices already showed obvious signs of depletion and low productivity. The abusive use of fire and the cultivation of sloped soils - which most are in the zone - without the required measures to fight erosion, were the main factors to which this premature exhaustion of the land should be assigned (LEITE, 1945, p. 2).

In the same report he made a moral judgment of the farmers: "Man, clutching the eternal law of least effort, prefers exploring new lands to preserving the fertility that his hands have destroyed" (LEITE, 1945, p. 3). As a solution, the director suggested "effective and mandatory rural education, and technical and material assistance. These would be part of a plan that - if well executed - would transform the rural landscape in 10, 20 or 30 years" (LEITE, 1945, p. 4).

From a positive perspective, the director indicated that other practices were being adopted, even if only by a few farmers, referring to the use of mechanical weed cutters and corn treshers, replacing the hoe and manual treshing. He said: "Although the agricultural practices may influence the increase in production in a certain way, they cannot play any role in the present case, since there was no substantial change in the current practices of the settler in this area in recent years" (LEITE, Jan./Feb. 1946, p. 1).

In the informative summary drawn up in 1945, the head of the 4th agricultural zone points out the main crops of the municipalities, regarding their production value: corn, tobacco, cassava, beans, wheat, rice, potato, alfalfa and flax. Corn production stood out and was basically transformed in beef and pork fat (LEITE, 1945, p. 5).

The Actions of the Cooperation Field/Agricultural Station

The head of the station, an agricultural engineer who was aware of his role as an agent of innovation, devoted himself to deploying new techniques in the lands of the Permanent Cooperation Field/Agricultural Station as a way of demonstrating solutions to the problems that were piling up in the regional agriculture.

Soil Conservation, Erosion and Fertilization

Soil Conservation is one of the recurring themes in the reports of the station. Deforestation had left the land vulnerable to erosion by rainwater and infertile because of the inadequate management and the absence of inputs and organic matter. Hilnon Corrêa Leite reported that - in the absence of theodolites - he built terraces in the CCP lands in 1945 using a very simple apparatus called "chicken foot" *(pé de galinha*) made of wood and a mason's level:

> This was probably the first terraced plot in the region and it served as attraction to farmers passing by. It was a modest beginning of soil conservation, which deserved greater dissemination soon after, with the creation of a conservation unit of the Ijuí Agricultural station and the Ijuí Conservation Association (LEITE, 2004, p. 56).

In the Bulletin of the 3rd quarter of 1946, the director was optimistic in relation to the farmers and he mentioned, with satisfaction, the visits he had made to the Pejuçara district, which allow us to get an idea of the activities of the institution:

> We cannot conclude without mentioning the satisfaction from all the visited settlers with the interest shown. They are convinced that they will have to re-fertilize the land or emigrate. Preferring to continue on the land that received them and their ancestors, they show the most keen interest with respect to combating erosion, green and chemical fertilization, combating leaf-cutter ants and all possible means of getting healthy crops. This fact is not common in this municipality, since few demonstrate a desire to learn new things; most prefer just material assistance: seeds, machinery (LEITE, 1946, p. 3).

In the Quarterly Bulletin of the 1st quarter of 1947, the director once again referred to the Pejuçara district, pointing out the results of the actions of the Permanent Cooperation Field:

> In Pejuçara the possible means to restore the fertility of the land were also addressed, stressing the need to start the fight against erosion and the green fertilization practice. The meeting was attended by more than 80 farmers and Mr. Luiz Londero was willing to start the fight against erosion on his land under our guidance and with the presence of all the parties concerned (LEITE, 1947, p. 6).

One of the objectives of the CCP, and later of the Station, was to encourage the use of agricultural machinery. The following were available during the installation of the CCP in 1944:

a wheat mower-baler, a thresher of the brand '*invencível*' with a petrol engine, a cereal classifier, an "AR" John Deere tractor, a Santa Eliza set (pulper, thresher and cereal classifier), mold board and disc plows, sowers, a potato seed planter, disk harrows, a weed cutter and "many other" machines. Tractor operator courses completed the actions of the CCP/Station in the 1950s (LEITE, 2004, p. 54).

In the informative summary of the work carried out in the period from January to August 1950, the director complained that if "this station cannot have a mechanized assembly for the construction of terraces, then the fight against erosion will not have been done as would be desirable, that is, as a preliminary operation for any cultivation" (LEITE, 1950, p. 2). In the informative bulletin of 1951, he criticized the Ministry of Agriculture for neglecting the fight against erosion:

> It has not even been understood by the Ministry of Agriculture, which limits itself to sending posters on the value of the soil and the means to prevent its impoverishment, as if these were in reach of the settlers. Not even the station has a soil conservation plan, because it doesn't have the materials, level or mechanized assembly needed (LEITE, 1951, p. 2).

The complaints of the director geared to the Ministry of Agriculture are frequent from the end of the 1950s onwards, suggesting government completely abandon the agricultural stations in the country for an indefinite period (LEITE, Jan./Dec. 1960, p. 2).

The fertilization theme is recurrent and seems to be hindered by the costs. In an article published in a column of the newspaper *Correio Serrano* of 17 May 1952, the director emphasized the need to fertilize the soil and said that the costs would be rewarded by the productivity results: "Producing the maximum in a given area is the motto of those who practice rational fertilization. It is necessary to abandon the idea that fertilization is anti-economical. It does in fact require upfront costs, but this is widely compensated with the future increase of the harvest" (CORREIO SERRANO, 17 May 1952, p. 5). In 1957, the director of the station received a study scholarship from the United States Department of Agriculture, where he participated in soil conservation programs and visited several agronomic institutions (LEITE, 2004, p. 41-47).

In the quarterly report from April to June 1959, Leite revealed the first collaborations of the station in the soil conservation task: "Together with the municipality, the *Southern Credit and Rural Assistance Association* (Associação Sulina de Crédito e Assistência Rural, ASCAR)[6] and the settlers, we are working on a motivation project in order to be able to accomplish conservation services in the so-called small properties" (LEITE, 1959, p. 3). In 1961, "19

farmers were served with terrace and small dam leasing and construction services, the terraces cover 235 hectares" (LEITE, 1961, p. 13).

Wisconsin University and Operation Tatu

The soil conservation actions, a constant concern since the installation of the Station, would be greatly impacted by the program entitled *Operation Tatu IV,* triggered in 1968 and developed with the collaboration of a set of institutions. Operation Tatu, a broad soil correction project led by the University of Wisconsin and the Agronomy Faculty of the Universidade Federal do Rio Grande do Sul, aimed to recover the fertility of the soil through chemical inputs. The American university sent soil experts, a soil analysis laboratory was built in the municipality of Santa Rosa and thousands of tons of fertilizers and limestone were applied on agricultural land. To this end, the farmers had access to ample financing with low and long-term interest rates. The 1969 informative report of the station recorded that six meetings were held that year with about 150 farmers and 575 soil samples were collected. Demonstration crops would be cultivated for the next step (LEITE, 1968). Regarding this project, the head of the station wrote with satisfaction that:

> Another pioneering activity the station has provided to the municipality and the region from 1958 until now, when the soil conservation services were started. Some thousands of hectares have been worked according to their peculiarities, seeking to protect the soil against the dire effects caused by erosion. Currently, soil protection in the region is the responsibility of the Ijuí Conservationist Association (*Associação Conservacionista de Ijuí*), a private institution. In 1968, with the station completing 20 years of operation, we have dedicated a large part of our time guiding farmers in the installation of the demonstration crops, collaborating with "Operation Tatu IV" in order to improve our major crops" (LEITE, 1971, p. 5).

In Ijuí, specifically, operation Tatu IV could count on the participation of Cotrijui, the Ijuí Conservationist Association, the Agricultural Station and Ascar. It is important to note the power of the banks in the implementation of this program:

> Through Operation Tatu IV, large official sums with subsidized and long-term interest rates were made available to the farmers. This took on great power, leading the farmer to adopt a certain line of fertilization, with stronger ties between Operation Tatu IV and the Ijuí Conservationist Association and the technical department of COTRIJUÍ being established since the banks would only finance calcareous resources for those farmers who had built their terraces. And this was a work driven by the Conservationist Association (FRANTZ, 1982, p. 145).

Another important action was the participation in the "Soil Fertility Improvement Project in the Ijuí Region", developed by the technicians of the Permanent Technical

Agricultural Development Council of Ijuí's municipal government. Its goal was to use "conservationist practices for the implementation of corrective fertilizer and liming, improving the fertility of agricultural soils in the municipalities of Santo Augusto, Augusto Pestana, Ajuricaba, Chiapeta, Catuípe and Ijuí" (PREFEITURA MUNICIPAL DE IJUÍ, 1969, p. 7).

The farmers were encouraged to participate in the plan with medium term financing benefits (five years) to pay for the investments. To participate in the project, each farmer "must compulsorily perform the following practices: soil conservation practices; employment of more productive and better-quality seed varieties; intensive pest and weed control practices" (PREFEITURA MUNICIPAL DE IJUÍ, 1969, p. 23).

Pesticides

One of the activities of the CCP/Station was to resell insecticides and fungicides to farmers in order to guide them in the most modern agriculture practices. In this sense, in the first report written by the head of the 4th Agricultural Zone in 1945, the agronomist Hilnon Corrêa Leite recorded that farmers were ignorant in relation to the pests and diseases that ravaged wheat crops: caterpillars, greenbugs, Myrtle rust and Blister smut (LEITE, 1945, p. 3). However, the worst plagues of the 1940s, 1950s and 1960s were the leafcutter ants (genera *Atta* and *Acromyrmex*), which attacked many species of plants. With the felling of the forest and the decrease in predators, these insects obviously turned their attention to the crops. In the 1930s, the Ijuí's Commercial Association (*Associação Comercial de Ijuí*) requested and obtained from the government of the state of Rio Grande do Sul a reduction of the rail freight value of arsenic, since it was "the product with the greatest application in agriculture to combat pests that damage crops" (CORREIO SERRANO, 9 Dec. 1933, p. 1).

The CCP/Station used what the market offered to combat these pests and does not mention research on the control of insects. The head of the station described the fighting strategies in his memoirs: Referring to the year 1940, he reported that the farmers used arsenic and sulfur in the form of smoke injected into the anthill, which could reach the site of the queen, eliminating her along with the workers. In the 1950s, they also used a formicide called "Gladiator", produced by a local company, Sidenberg & Cia, which consisted of a "liquid composed of two gases that formed upon contact with the air when the bottle in which it was packaged was opened. Because it was heavier than air, it penetrated the queen's chamber, killing the queen and the workers" (LEITE, 2004, p. 61). At the same time, still according to the report of the head of the station, they began to use "methyl bromide with the more convenient and easier to handle Blenco applicator." The biannual informative report of the station also mentions

the use of carbon disulphide (LEITE, Jan./Aug. 1951). Gaseous methyl bromide was used as a formicide of immediate effect. It has found other, more recent uses, such as the control of various insects, fungi and soil nematodes. Currently, the use of this product is restricted in Brazil and there is an international effort, based on the Montreal Protocol, for its elimination, because it is one of the gases that destroy the ozone layer of the atmosphere (MONTREAL PROTOCOL, 1987).

A more economical and efficient alternative was the use of baits poisoned with Aldrin, an organochlorine insecticide that is very toxic and persistent in the environment, which was banned in Brazil in the 1980s for use in agriculture, but was still permitted for the production of formicides. It was definitively banned in Brazil in 1998 (BRASIL, 1985; BRASIL, 1998). The Stockholm Convention, held in 2001, included Aldrin on its list of top 12 Persistent Organic Pollutants, seeking to eliminate its use in the signatory countries (STOCKHOLM CONVENTION, 2001).

The control of ants was the reason for a big campaign in 1960, with the help of the Capuchin Friars through the Base Community Movement and of the Rural Workers Union. This movement is mentioned as exemplary for the spirit of cooperation between farmers and it is often quoted by union and cooperative leaders. The movement's strategy was to attack the ant colonies based on cooperation and joint action at the same time in all rural properties so as to eliminate the insects' reproductive capacity. The campaign had good results, which caused a severe setback for the ants reproduction, poisoned primarily with the insecticide Aldrin.

In addition to ants, other pests of lesser impact and plaguing the fields and orchards were "fought with organic insecticides: pyrethrum and Timbó soap solution, Bordeaux and lime sulfur mixtures" (LEITE, 2004, p. 60). The archives of the station hold a leaflet with the recipe for an insecticide prepared with Timbó, common soap and water. The *Ateleia glazioviana* Baill tree is abundant in the northwestern part of the state and is known for its toxicity through the active ingredient rotenone.

Grasshoppers

October 28, 1946, is a remarkable date in the history of the peasants of the region. On the evening of that day, "clouds of grasshoppers invaded the crops of different locations, including those of the Cooperation Field. Almost all the crops were destroyed, with the exception of the wheat experiments, which were saved thanks to the staff's willingness to work on the following day, a Sunday" (LEITE, 2004, p. 56). The fight against the grasshoppers (*Schistocerca cancellata* or *Schistocerca paranensis*) was improvised "with the means we had

at our disposal: sulfur smoke and sprays of 'arsenical' plants, in the form of poisoned Timbó mixtures." In addition, they tilled the soil to expose the eggs to the sun and therefore prevent them from hatching (LEITE, 2004, p. 57). There are records of the passage of these insects through the region since 1906, causing damage to plantations in several following years (COMISSÃO DE TERRAS E COLONIZAÇÃO, 1900-1912).

At the same time the following year, 1947, "there was new and more violent attack of the plague which could be fought better this time because we had received material sent from Porto Alegre beforehand. Powder sprays, flamethrowers, baits based on bran and gamexane, in addition to other materials" (LEITE, 2004, p. 57). The head of the station stated that "this time, the Brazilian government had prepared itself preventively for the future and stocked dozens of tons of the pesticide hexachlorobenzene (BHC), known as grasshopper dust, at the Agricultural Station. Since 1950, the plague no longer appeared" (LEITE, 2004, p. 60). The powerful pesticide was stored on the premises of the station for decades: "Only at the end of January of this year [2004], the 34 tons of pesticides were transported to Rio de Janeiro in order to be incinerated in a special furnace, existing only there and in São Paulo, according to information provided by IRDER's manager" (LEITE, 2004, p. 58). According to Hilnon's evaluation, "the grasshopper clouds ceased to be a problem probably because the areas of their natural habitat were decontaminated" (LEITE, 2004, p. 60).

The station continued to resell insecticides, fungicides and fertilizers. In 1951, the Station's administration informed the state government that it had the following products available: **Gesarol**, methyl metacrylate, Uspulum, copper sulfide, arsenic, sulfur, molybdenum disulfide, superphosphate, bone flour (LEITE, Jan./Aug. 1951, our emphasis). In 1965, a price evaluation made at a local commerce included these poisons: Carunchol, Hexapura, **Gerasol**, Halagran, Aldrin and Ridorato (LEITE, 1965, our emphasis). **Gerasol** was the trade name of Dichlorodiphenyltrichloroethane (DDT), an organochlorine insecticide that acts on the central nervous system. Its effects were studied and denounced by the researcher Rachel Carson (1964). Because it is very dangerous to humans and the environment, the agricultural use of DDT was banned in the United States in the 1970s (UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, 2015). In Brazil, however, the definitive ban happened only at the beginning of this century (BRASIL, 2009). In the 1940s, DDT was applied among other things to the stored seeds in order to eliminate insects (GERMEK, 1947).

New Crops: New Pests

In the assessment of Argemiro J. Brum, the green revolution was the "flagship" of the agricultural modernization in the world and therefore also in Brazil (1985, p. 69). Still according to Brum,

> In countries like Brazil, where the "Green Revolution" was not accompanied by agrarian reform […], both economic and mainly social consequences arose. In these countries, the "Green Revolution" was only the instrument of a "conservative modernization", which helped to further the internationalization of the economy and worsen dependency (1985, p. 71-72).

The government incentives for the modernization of the crops in the region, in accordance with the Green Revolution, led to the concentration of production in two crops that became predominant in the 1970s. Wheat and soybeans, grown in winter and summer, respectively, replaced the mixed cropping that was practiced by farmers until then. One of the consequences of monoculture was the development of pests that previously caused few problems. To fight them, a set of actions was adopted involving pesticides in quantities never before seen in the region as well as the use of new machines to apply poisons, including spray planes. These actions were triggered by private companies, with strong participation of the Cotrijui.

A leader of the cooperative said in an interview that the institution was aware of the problems arising from the large volumes of insecticide that started to be used, that is, "we have started to be concerned with the biological imbalance in nature. There has been great concern in understanding the biological control that existed on this pest (the wheat aphid) and we have decided to only use pesticides as a last resource" (FRANTZ, 1982, p. 146). However, the Cotrijui itself took it upon itself to promote the spread of nighttime aerial spraying in the region at the beginning of the 1970s and, in 1975, it founded its own spraying company, AeroCotrijui (FRANTZ, 1982, p. 146).

The main pests of these monoculture crops were the wheat aphid and the thistle caterpillar, which were fought with pesticides. The agricultural engineers prescribed applications of the dangerous insecticides DDT, Parathion, Endrin and Diazinon (CORREIO SERRANO, 3 Dec. 1969, p. 11). The results of this practice did not take long to appear in the main newspaper of the region, the *Correio Serrano*, which reported on dozens of cases of intoxication of farmers, water contamination and the death of fish and other animals in the 1970s. A recent study conducted in Santa Catarina State showed that the dangerous effects of pesticides on human health were unknown or underestimated even by agricultural technicians and agronomists in the 1970s (CARVALHO; NODARI; NODARI, 2017).

Modernization Progresses: the End of the Agricultural Station

At the end of the 1960s, the Station had lost its relative importance because of the expansion of the Cotrijui and other institutions. From the point of view of rural extension, the Ijuí municipality could count on an Ascar office since 1957. In addition, the Base Community Movement led by the Capuchin Friars, maintainers of the Philosophy Faculty, helped in the organization of meetings with small growers and led to the participation in modernization projects and in the Cotrijui. The professors Argemiro J. Brum and Mario Osório Marques participated actively in this process and noted in their memoirs:

> In addition to the courses given by the Basic Education Institute, frequent film exhibitions were held in the centers, followed by discussions. A great incentive was given to soil conservation and the use of modern agricultural techniques, a subject that was often raised in the meetings of the centers. Wheat growing was also encouraged in the small and medium-sized properties as a land management improvement factor, since it is a more demanding crop that counts with easier credit conditions with more solid economic prospects (BRUM; MARQUES, 1972, p. 52).

In its women's column, the local Ascar office presented the central argument for the ongoing modernization:

> It should be very clear to our men of the countryside that land area is not the limiting factor for success in agriculture. It is above all the quality of the earth which will make farm work be satisfactorily rewarded. To obtain a fertile soil, it is necessary to put aside routine practices. […] The day will come when he will see that his twenty-five hectares are sufficient to live as he deserves. To live and not just survive. Healthy land is a sign of progress. Don't let erosion weaken your land! Plant in contour lines. Make use of terracing (CORREIO SERRANO, 11 May 1966, p. 5).

Modernization was presented as the solution to the crisis of colonial agriculture practiced in small lots. It was not limited, however, to taking care of the soil and preventing erosion, but required more extensive changes in farming practices and the adoption of new technologies. In the Ascar reports, the local office reports on a series of rural extension actions: the formation of 4-S clubs for the rural youth, demonstration farms, lectures on hygiene, food and housing, fertilizing and soil correction, zootechnical guidelines for pig farming, pest and disease control and milk hygiene. The Annual Plan of 1966 included the soybean cultivation project, focusing on the importance of this crop and its future in the region, suggesting technical measures concerning the fertility of the soil, seeds and pests (ASCAR, 1966).

The sale of poison became common in the numerous local agricultural stores and especially through the cooperative. The Cotrijui was founded with direct support from the federal government to encourage and monitor the production of wheat in order to ensure the

national output. In the 1960s, the cooperative gained a monopoly in the purchase of the product, coordinated through state funding of the Banco do Brasil. Access to credit would go through it, and it demanded the adoption by the producer of the techniques recommended by the ongoing modernization guidelines.

The Cotrijui became a huge undertaking, with thousands of members, and it organized a technical team to guide growers. The technical department took on important functions in the region, and as such the Ministry of Agriculture transferred the structure of the Agricultural Station to the Cooperative in 1976. The development of the modernization process linked several public and private institutions with their own interests.

The company *Indústria de Máquinas Agrícolas Fuchs S.A.*, which for many years dedicated itself to producing lard cans and manufacturing pig farming equipment, started producing plows to be used with tractors and graders, and it created two types of terrace ploughs to make contour lines, taking into account the demand generated by the campaign to fight soil erosion. It also manufactured sowing machines, balanced feed mixers and grain crushers. Interestingly, one of the directors/owners of the company was a founding member of Ijuí's Conservationist Association (*Associação Conservacionista de Ijuí*), created in 1965, and the Ijuí Natural Environment Protection Association (*Associação Ijuiense de Proteção ao Ambiente Natural,* AIPAN), founded in 1973; that is, in the middle of the modernization wave produced by the Green Revolution, a producer of agricultural machinery benefited by this same process became an environmental leader.

At this stage of the changes, the machines of the station were lent out free of charge to farmers through a simple and unbureaucratic procedure, which consisted of a quick cooperation contract signed at the time of withdrawal. Between 1948 and 1954, machinery and implements were borrowed or rented at low cost to 3401 farmers (LEITE, 2004, p. 82) including tractors, which were very costly at the time and few small farmers possessed. In 1969, "with the creation of the Mechanized Motor Patrol, a spinoff of the Station, more emphasis was given to the work of heavy tractors, deforested land clearing conveyors" (LEITE, 1971, p. 1). These new machines started to be used after charging "reasonable rents" (LEITE, 2004, p. 95).

The Station also started losing its importance to the extent that other institutions and private companies began to control the agricultural modernization process. Agricultural machinery, chemical fertilizers and pesticides started being resold with credit support by numerous companies, which also provided technical assistance. At the same time, the credit granted by the agency of the *Banco Nacional de Crédito Cooperativo* (BNCC) forced growers to submit to registries and use compulsory techniques to qualify for funding. Not by chance,

the Station was transferred to Cotrijui in 1976 and later, in 1994, to the Integration, Development and Education Foundation of the Northwest of the State (*Fundação de Integração, Desenvolvimento e Educação do Noroeste do Estado*, FIDENE). The director himself recognized the limitations on the Station's activities:

> Realizing that it would be impossible to meet all the ramifications of the grazing and agricultural activities in the region, our scope of action had to be pioneering, on the one hand, and supplementary to private initiative, on the other. Pioneering, in the sense of introducing new technology and new machinery; supplementary when private initiative, by itself, was unable to meet the demands of the growers. These activities were naturally dictated by the needs of the time (LEITE, 1971, p. 6).

In 1971, after 23 years of activities, the agronomist Hilnon Corrêa Leite wrote an account of his management. He was modest when evaluating the period under his leadership and highlighted the changes underway:

> Whether the activities of the Agricultural Station are commendable at this stage is not for us to judge. May others use their good judgment and impartiality after next year, when a new direction, new methods and new elements will be employed with more human and financial resources with the work philosophy, and we hope they may have the same high ideals that guided us all this time (LEITE, 2004, p. 97).

No criticism was spared to the modernization process based on the cultivation of soy in summer and wheat in winter: "Modernization was seen as a sort of panacea capable of solving the difficulties of small growers" (FRANTZ, 1982, p. 102). In an interview to a newspaper in 1983, the technical director of the Cotrijui stated that:

> The miracle ended and it served only to benefit the selective technologies that protected only some growers. Modernization happened too quickly through a magic button, which was the credit geared to the major crops of large growers (COTRIJORNAL, Oct. 1983, p. 5 apud CALLAI, 2007, p. 75).

Another powerful criticism of modernization is environmental in nature, especially concerning the contamination by pesticides. Data on the cultivation of soybeans from 1973-1974, gathered by the government of Rio Grande do Sul, show a worrying picture and reveal the new model of agriculture: during the period, approximately 10 thousand tons of pesticides in powder and 1,700,000 liters of liquid poison were used in the state. In the same period, 652 cases of intoxication occurred with farmers. Of these, 428 were hospitalized and six resulted in death. Deaths of animals in rural properties were also recorded: 549 cattle, 121 sheep and 235 pigs, in addition to fish and species of the local fauna (COOPERATIVA-JORNAL, Sep. 1974, p. 11).

Conclusion

The deployment and operations of the Station were based on the idea that the traditional agriculture adopted by small farmers and immigrants, with its indigenous and native origins, was backward and inefficient. This idea was further fed by the crisis traditional/colonial agriculture was experiencing at the time, marked by the exhaustion of the model of agriculture in small rural lots adopted in the colonization projects with immigrants and their descendants, which had been very common in the region.

The agricultural changes introduced by the Station started before the Green Revolution and contributed to the deployment of so-called "modern" technologies and practices. With the advancement of modernization in agriculture and the creation or strengthening of other institutions, the Station lost its initial spotlight and started playing a peripheral role.

Finally, the possibility of connecting different fields of historical knowledge to understand the trajectory of the Cooperation Field/Agricultural Station, should be noted. Agrarian history, agricultural history and environmental history intersect in the narrative. In this approach, the increasing use of pesticides in agriculture in the period under study stands out as one of the foundations of the expansion in productivity. A large part of these pesticides, which were presented as modern, were highly toxic and caused several types of damage to the environment and human health.

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4 This region was inhabited by indigenous peoples of the Kaingang and Guarani groups for thousands of years. As a result of the invasion by Europeans, the population was confined to areas demarcated in unilateral decisions.

5 National farmers is a current expression in historical documentation to refer to the peasants who inhabited the region before the arrival of immigrant settlers of European origin. Another term widely used to designate them is "caboclo".

6 The Southern Credit and Rural Assistance Association (*Associação Sulina de Crédito e Assistência Rural*, ASCAR) opened an office in Ijuí on 25 July 1957 (CORREIO SERRANO, 25 Jul. 1957, p. 3).