ON THE FOUNDATION OF AGRICULTURAL POLICY RESEARCH IN THE UNITED STATES

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Abstract

This paper identifies three scientific research programs in agricultural economics. The farm management approach (1870-1933), the farm problem approach (1933-1982) and the domestic and global welfare approach (1982-). In respect to agricultural policy research two competitive research programs developed out of the farm crisis of the 1920s. One program argued for government intervention in agriculture. The other argued for intervention in the general economy. The former program degenerated during the 1970s because of countervailing empirical evidence and a change in the understanding of positive economics. The latter program stayed progressive by adding the international dimension and by applying welfare economic analysis. Two other important factors influenced the development of agricultural policy. First, the unique institutional set up of the land grant system in which agricultural economics was founded as an applied science with a bias to help farmers. Second, the convergence of agricultural economics towards general economics that shifted the approach from applied to basic.

Keywords: Agricultural policy, History of economic thought, American agricultural history

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1. Introduction

The American tradition of agricultural economics and thus agricultural policy has been the dominant school of thought in international scientific societies and universities around the world after the Second World War. This American tradition was founded in the beginning of the 20th century in close connection with the land-grant universities founded earlier and the establishment of the United States Department of Agriculture (USDA). According to Fox (1988) agricultural economics was firmly established as a scientific area in 1922 when the Bureau of Agricultural Economics under USDA was founded (Fox, 1988 p. 55).

Viewing the literature on agricultural policy in America two major shifts in the theoretical approach can be identified. The first one occurs in the beginning of the 1930s and the second one around 1980. The mainstream economic literature in the period from late 1890s to the beginning of the 1930s looked inside the agricultural sector to find solutions which could help farmers overcome eventual economic crises and increase their income (Taylor and Taylor, 1952). These solutions deal with minimizing costs of production and better farm management in general (Taylor, 1905). During the period from the 1930s to the late 1970s the mainstream view among agricultural economists was based on agriculture being a part of the American economy. The basic argument was that problems in the agricultural sector should not only be solved in agriculture itself. Due to linkages to the national economy general economic policy was also an important part of the solution (Schultz, 1945; Hathaway, 1963; Tweeten, 1970; Schuh, 1974). From the 1980s to current time the focus of mainstream agricultural policy literature has been the relationship between agriculture and the international economy and the approach to policy analysis has been welfare economics (Gardner, 1986; Tweeten, 1989; Johnson, 1991).

It is interesting to observe that, at the time of major changes in the theoretical approach to agricultural policy, major events in history have taken place. The first shift occurred in 1933 when the newly elected President Roosevelt launched his "New Deal", which introduced full-scale government intervention in agriculture. The "New Deal" was a reaction to a period of general economic depression when American agriculture suffered severely (Faulkner, 1964 pp. 661-665). The second shift occurred at the time in history when agriculture was included in the Tokyo-Round (1973-1979) under GATT (General Agreement on Tariffs and Trade) for the first time in the international trade negotiations. Around this time it was obvious that agriculture had to be a part of GATT. A major downturn in the world prices of farm products fuelled protectionism and threatened international trade in general (Hathaway, 1987).

[1] Comments to earlier versions of this paper from participants at the Sixth Annual Conference of the European Society for the history of economic thought, Martch 2002 in Crete, Greece and from Soren Brier, Karsten Kyed, Niels Kaergaard, Philip L. Paarlberg, Don Paarlberg and Luther Tweeten are much appreciated.

From an academic point of view these two above-mentioned shifts in the theoretical approach to agricultural policy are in their historical context rather fundamental and justify further investigation of these three periods. The aim of this paper is *first* to identify the above mentioned periods and shifts in the literature of agricultural policy and *second* to highlight factors inside and outside the science of agricultural economics which have had influence on the developments. To be able to make this analysis a synthesis of the methodology from Kuhn (1970) and Lakatos (1970) will be used to organize the literature and identify the inner nature of both periods and shifts. Section 2 presents the relevant aspects of these theories and sets up the analytical framework. Section 3 identifies the first period from 1870-1933. Section 4 the second period from 1933-1982 and section 5 identifies the third period from 1982 to the current time. All periods will be presented in their respectively historical context. Section 6 discusses the periods and shifts in relation to the theories of scientific paradigms and scientific research programs. The conclusion is in section 7.

2. Establishing an analytical framework

The intention of this section is not to give a full presentation and discussion of scientific paradigms and scientific research programs and their applications in economics. For this see Blaug (1985)[2]. In this paper the theories of Thomas S. Kuhn and Imre Lakatos will be used to set up a framework in which the three periods in the theoretical approach to agricultural policy can be analyzed. Both authors deal with the organization of science in a historical context and present theories of how scientific progress proceeds over time. Before these theories are presented a definition of agricultural economics and agricultural policy will be useful.

Traditionally economics hence economic research is the analysis of *what is* and economic policy research the analysis of *what could be* (Ely, 1937), The analysis of *what is* encompasses the description of economic phenomena and their regularities. Analysis of *what could be* centers on an evaluation of changes carried out or changes which could be made in economic development in order to achieve certain social-ethical ideals (Larsen, 1994). To be able to make a rational policy analysis and say *what could be* this analysis must be based on *what is*. Analog to this we will define agricultural economics as *what is* and agricultural policy as *what could be*. This means that agricultural policy analysis to be considered as objective and economically rational must be based on the understanding of agricultural economics.

In his famous book *The Structure of Scientific Revolutions* from 1962 and in an enlarged edition from 1970 Thomas S. Kuhn argues that what he calls *normal science* is the rule and revolutionary science is the exception when the history of science is viewed and analyzed[3]. By this he means that scientific work in long periods can be characterized as a problem-solving activity in the contexts of one and only one orthodox theoretical framework also

[2] The terms paradigm and scientific research programs have been used in economics mostly in discussions on the shifts between Classical, Neoclassical, Keynesian and Monetarist economics. In agricultural economics the use of the terms has been limited to some recent publications about the new paradigm of agricultural policy research. For this see Tweeten & Thompson (2002).

[3] Normal science being the rule and revolutionary science being the exception were controversial because Karl R. Popper who represented the mainstream view at that time believed that science always was in a state of permanent revolution.

known as a *scientific paradigm*. A paradigm will here be defined as a common possession of the practitioners of a particular discipline in a broad sense meaning that the practitioners are using the same core of theory and techniques and also share an entire constellation of beliefs and values (Kuhn, 1970 p. 173). In Kuhn's own book (Kuhn, 1962) there are twenty-one different definitions of the term paradigm (Mastermann, 1970). This indicates the complexity in understanding Kuhn's theory, see Lakatos & Musgrave (1970). The crucial point in Kuhn's work is that a build up of *anomalies* can result in a *revolutionary crisis* ending in an overthrow of one paradigm by jumping to a new paradigm. This breakdown of normal science is motivated by a build-up of theoretical and methodological controversy between the old and young generation of researchers whom according to Kuhn (1970) often talk past each other. The term revolution is used to indicate that arguments to support a new paradigm always contain irrational elements that go beyond logical or mathematical proof (Kuhn, 1970 pp. 199-200). After the revolution peace and harmony settles and a new long period of normal science begins.

According to Lakatos (1970) and (1978) the history of science can be described as the history of *scientific research programs* which all can be characterized by a so-called *hard core* that contains purely meta-physical beliefs and positive and negative heuristic. Around this hard core there is a *protective belt* that contains the flexible part of the scientific research program. This belt is made up by theories and hypotheses which must bear the brunt of tests (Lakatos, 1978 pp. 49-52). If a scientific research program is generating theory and/or empirical evidence the program is said to be *progressive*. Conversely, if the scientific research program is characterized by an endless addition of ad hoc adjustments that merely accommodate whatever new fact becomes available, the program is said to be *degenerating* (Lakatos, 1978 pp. 33-34). As already mentioned implicitly many scientific research programs can exist at a given point in time and these programs can either be progressive or degenerating. Two things can happen with a degenerating scientific research program. In rare cases it once again can turn into a progressive one. But more often the degenerating program will cease to exist and a new progressive program will pick up the relevant bit and pieces. In Lakatos´s world these shifts from degenerating programs to progressive programs do not consist of any forms of irrationality. The preference for a progressive program over a degenerating one is purely rational because the scientific gain always exceeds the scientific loss (Blaug, 1985 p. 35).

Finally, the framework for the following analysis will be presented. For this a synthesis of the two approaches will be used to organize the theoretical literature and identify the periods and the shifts. Because as Kuhn himself pointed out "Though his terminology is different, his analytic apparatus is as close to mine as need be: hard core, work in the protective belt, and degenerating phase are close parallels for my paradigms, normal science, and crisis" (Kuhn, 1970b p. 256). The idea is then to organize and categorize the literature in three groups referring to periods of normal science/progressive science, periods of anomaly and periods of crisis/degenerating science. This is done below in table 1 and laid out in sections 3, 4 and 5. In terms of rationality or irrationality driving the changes from one research period to another this paper will define rational research as research not influenced by the scientist's values and beliefs. Irrational research is defined as research being affected by values and beliefs and other factors outside science like the reality the scientists live in. Let us now turn to the first period.

Table 1. A systematic overview of the paradigms/scientific research programs in the theoretical approach to agricultural policy

	Farm management approach (1870-1933)	Farm problem approach(1933 -1982)	Domestic and global welfare approach (1982-)
Normal science	Agricultural economics arose from the farm management tradition founded in the institutional framework of land-grant colleges, research stations and extension services. The slogan was science with practice and the idea was to help agriculture to better income by improving productivity and general farm management. Data from the research stations and extension services created a tradition of empirical work concerning individual farms. Mainstream textbooks in this paradigm are Taylor (1905), Warren (1913) and Black (1926).	The common accepted economic framework in this period is the farm problem model. The symptoms of the farm problem are low and unstable income. The fundamental roots of the problem are the special characteristics of agriculture. Textbooks in this paradigm are Schultz (1945), Johnson (1947), Cochrane (1958), Hathaway (1963), Heady et al. (1965), Tweeten (1970) and (1979). Two schools of thought to solving the problem. One argues price support and supply management and one argues government out of agriculture and for stable and sound fiscal and monetary policy	Agricultural policy reform is necessary because traditional policy instruments create distortion and transaction costs for both the national and international economy. If, to achieve certain political objectives agricultural support is necessary, this support must be given in such a way that agricultural production is not effected. The approach is welfare economic analysis, hence market failure and government failure Mainstream textbooks in this tradition are Gardner (1987), Tweeten (1989), and Johnson (1991)
Anomaly	Nourse (1916) introduces the international dimension Black (1929) deals with the relationship between the agricultural sector and the general American economy and argue for supply management Warren and Pearson (1924) argues for monetary stability	Johnson (1973) introduces the effect of national policy on international markets and his conclusion is negative. He argues in string terms for reform. Schuh (1974) analyses the influence of the macro -economy on American agriculture. The argument is that a overvalued dollar has undervalued agricultural resources. Later work supports these arguments (Schuh, 1979).	
Crisis	The great depression in the late 1920s hits both agriculture and the rest of the economy hard and the close relationship is obvious to everyone.	Tokyo-Round 1973-1979 The trade mandate to the OECD in 1982 introduces the new dimension in the academic policy debate.	

3. The Farm Management Approach, 1870-1933

According to Taylor and Taylor (1922) agricultural economics arose from the farm management tradition which grew out of a unique institutional set-up of government supported colleges, research stations and extension services founded in the period 1860-1900. In this period the United States Department of Agriculture (USDA) was established. This happened more precisely in 1863 and from the beginning USDA took a leading role in the development of the modern agricultural sector. After that the war of independence between the British and the settlers of North America ended in 1783. Immigrants followed and many of these new Americans settled as farmers. They moved the frontier further and further west until it finally disappeared around 1890 (Turner, 1920 pp. 1-38). The fixing of the arable base together with the continued inflow of immigrants forced agriculture to raise productivity through better techniques and management. The *Land-grant system* was created to help farmers in fulfilling their task[0]. A close relationship arose between the scientists and the farm communities. The consequence was that most of the work done by agricultural scientists and economists in the land-grant system focused on the farmers' own possibility though better management to lower costs of production and thereby increase income. Thus the first generation of what could be called agricultural economists was highly motivated to help farmers (Ingersent and Rayner, 1999 p. 111). Their work was more empirically oriented than theoretically oriented because data from the research stations and extension services were plentiful. Along the way some general elite universities opened positions for the best and most theoretically founded agricultural economists. These agricultural economists brought with them a strong basis in empirical work. Together with the theoretical based university research, this combination between economic theory and empirical evidence became the foundation of agricultural economics. The short story of the establishment of agricultural economics, however, according to Fox (1988) is that agricultural economics was firmly established as a scientific area in 1922 because the Bureau of Agricultural Economics[0] under USDA was founded that year. This strong postulate indicates that the institutional set-up, with USDA in the center, played an enormous role in the development of the agricultural complex in the United States. The rest of this paper will show that this is true.

Normal science in the farm management period in these infant years of agricultural economics was concerned with improving the efficiency and productive base of American agriculture (Taylor and Taylor, 1922). Textbooks in this period summarizing the mainstream view are Henry C. Taylor's *Agricultural Economics* from 1905 dealing with farm management applied with modern production economics. George F. Warren's *Farm Management* from 1913 dealing with the organization of farms on a empirical basis and John D. Black's *Introduction to Production Economics* from 1926 introducing topics like specialization and comparative advantage in agricultural economics (Fox, 1985 pp. 57-58). According to Taylor and Taylor (1922) and Fox

[4] The main reason for the Land-grant system was the Morrill Land Grant Act of 1862 which authorized funding for a college of agriculture in each state. Under the act Congress would donate to each state public domain land that could be sold for settlement. The receipts were to be used for to endow support and maintain agricultural education in at least one college in each state (Ingersent and Rayner, 1999 p. 62). To complete the story, not only laws of the establishment of the United States Department of Agriculture and the Land-grant system are signed in 1862 also the famous Homestead Act and the Transcontinental Railroad Act were signed this year (USDA, 1962).

[5] The Bureau of Agricultural Economics was a merger of the Bureau of Markets, Bureau of Crop Estimates and the Office of Farm Management and Economics (USDA, 1922)

(1985) only a few contributions dealt with topics outside the mainstream view before the 1920s. In *Agricultural Economics* from 1916 by Edwin G. Nourse the international dimension is touched briefly in one chapter.

During the 1920s the scientific crisis set in. This crisis was triggered by an agricultural depression that persisted throughout the 1920s and into the 1930s. According to Paarlberg (1984) there were two schools of thought as to the cause of the farm crisis. One school was led by John D. Black professor of agricultural economics at Harvard and one school was led by George F. Warren, professor of agricultural economics at Cornell. Black's ideas were well presented in his book *Agricultural Reform in the United States* from 1929. His diagnosis of the problem was very consistent with the mainstream view in this period of research. He believed that though the problems of agriculture were a mix of factors inside and outside agriculture the cure for the disease had to be implemented inside the agriculture sector. This was because some fundamental forces had the tendency to result in overproduction which translated into persistent low prices, hence low income. He strongly advocated government intervention in terms of supply management through an ambiguous plan called *the domestic allotment plan*[4]. The basic idea was to control production at a level where prices were acceptable. George F. Warren together with Frank A. Pearson, professor of price analysis at Cornell published their book *The Agricultural Situation – Economic Effects of Fluctuating Prices* in 1924. In that book they argued that the problem was general in nature mainly caused by monetary chaos due to failures in both domestic and international monetary policy under the gold standard. These policies resulted in periods with both high deflation and high inflation so important price signals had been useless in the adjustment process. Warren and Pearson were at that time seen as radicals and the school of though represented by John D. Black became the theoretical foundation for the farm legislation of the New Deal. Throughout the 1930s Warren and Pearson argued their case and published the book *Prices* in 1933 and another book *Gold and Prices* in 1935[5].

From 1922-1929, the American economy in general experienced a boom never seen before in history. People believed that this situation was permanent and speculation was the easy way to earn money because of the rapid increase in prices. This period is often referred to as the *great illusion* (Faulkner, 1964 p. 603). On the 29th of October 1929, the New York stock exchange collapsed and it was soon clear that the country was in the middle of a deep and persistent depression[6]. In 1933, the newly elected President Franklin D. Roosevelt launched the New Deal.

[6] The domestic allotment plan was not Black's idea. The plan can be traced back to 1926 when W. J. Spillman an economist, employed by USDA published an article on this issue. In 1927 he published a book *Balancing farm output* on the same topic. John D. Black is normaly credited for the plan because he made it operational and advocated it to become part of the Agricultural Adjustment Act.

[7] It is always interesting to investigate futher the background for research done by people whom are considered as radicals by their own time. This is specially true in the case of George F. Warren and Frank A. Pearson becaurse they were Keynesians before Keynes. According to Paarlberg (2002) their ideas came from the reseach of Pearson. He had established price series for all kinds of items going back more than 200. They knew that prices were very important as adjustment signals to the producer. They could see in the 1920s that prices vere flucturating and producers had a hard time adjusting. They realized that a price is not only a function of supply and demand of that commodity but also a function of the supply and demand of money, hence gold.

[8] For an detailed overview of both the farm crisis of the 1920s and the great depression in the late 1920 and early 1930s see Benedict (1953) for the farm crisis and, Kindleberger (1973) and Galbraith (1979) for the great

The objectives of the New Deal were recovery, reform, and relief. Massive legislation was created from 1933 to 1935 with focus on industry, commerce and agriculture, regulation of labor and finance, and providing help for the poor. The New Deal for agriculture included massive government intervention in the sector. Relative to other sectors, this intervention was much more profound. This was a radical change in the government's philosophy of agricultural policy. The scientific crisis had evolved into a revolution. The main legislation on agriculture was the Agricultural Act of 1933 which included three titles. *First,* the Agricultural Adjustment Act (AAA) established the Agricultural Adjustment Administration within the USDA and gave far reaching powers to the Secretary of Agriculture. The main objective of AAA was to support farm prices and income so parity could be reached, meaning restoring the purchasing power of 1910-14. The powers granted to the secretary had to do with implementing both supply control and marketing measures to achieve the objectives. *Second,* the Emergency Farm Mortgage Act. This act was to rescue farmers in repaying their debt by giving state guaranteed support to those entitled (Ingersent and Rayner, 1999 pp. 96-97). *Third,* the Inflation Act gave the president the power to force the monetary authorities, to expand credit up to a certain limit, to devaluate the dollar up to 50 percent, and to accept silver as payment together with gold (Faulkner, 1964 pp. 656-657).

Summing up, USDA had a major influence throughout this period of the farm management approach and played an important role in the designing process of the New Deal. Finegold (1982) argues that without the expertise of agricultural economists trained by the pre-New Deal state and the land-grant system, the Agricultural Adjustment Act could never have been either designed or implemented. People like Wilson, Tolley, Ezekiel, Black, Nourse and many other agricultural economists took positions in the Agricultural Adjustment Administration or the Bureau of Agricultural Economics and their will and capacity were a major contribution to the success of the Agricultural Adjustment Act (Finegold, 1982 pp. 20-22).

4. The Farm Problem Approach, 1933-1982

The objectives of the New Deal were recovery, reform, and relief. The AAA succeeded in the short run in the sense of making both relief and recovery for farmers but failed the long run objective in reforming the farm sector. The effects of the farm policy were on one hand that nation employment share in agriculture fell by 7 percent between 1933 and 1939 and the acreage of wheat, maize, cotton and tobacco diminished by one-fifth. On the other hand, the policy resulted in an increase in productivity. Output per worker increased by 22 percent between 1932 and 1939. The net result was an increase in agricultural production of 11 percent. This situation created pressure for more and more direct government support of farm prices. One of the results was that American farm prices rose above world market prices. To maintain exports, the government started subsidizing them. In the long run the Agricultural Adjustment Act made this situation even worse because fixing farm prices at a (high) level made agriculture profitable so in term farm people did not leave the sector

The second period of agricultural policy research evolved out of the shadows of the great depression and the New Deal legislation for agriculture. Normal science in this period is in respect to *what is* a common accepted framework named the *farm problem model*. The

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depression.

symptoms of the problem are low earnings of most farmers and a great instability of income from farming. The farm problem model explains this in the following way. For agricultural products, 1) the demand is price and income inelastic because of Engel's Law, 2) the supply is very inelastic because of lags in agricultural production and fixed assets, 3) the supply is very unstable due to climate and biology, 4) technological change increases supply more than demand increases over time, 5) the speed of adjustment is slow and depends highly on developments in the general economy. Academic discussions among agricultural economists departed from this framework. The fundamental textbook is without any doubt Theodore W. Schultz's *Agriculture in an Unstable Economy* from 1945. On top of analyzing the internal characteristics of agriculture he formulated the important relationship between the agricultural sector and the rest of the American economy. One of the conclusions he made was that problems in agriculture could not be solved in agriculture alone but depended highly on general economic policy measures implemented to create a stable and sound economic development. Other central textbooks in this period are D. Gale Johnson's *Forward Prices for Agriculture* from 1947, Willard W. Cochrane's *Farm Prices, myth or reality* from 1958, Dale H. Hathaway's *Government and Agriculture - Economic Policy in a Democratic Society* from 1963, Don Paarlberg's *American Farm Policy – A Case Study of Centralized Decision Making* from 1964 and Luther Tweeten´s *Foundation of farm policy* from 1970 and a revised edition from 1979. These books all cover the above mentioned characteristics of the farm problem model. When it comes down to policy and *what could be* the above mentioned authors seem to disagree. This indicates that though they agree on the farm problem model they do not agree on the important insights of the model. Theodore W. Schultz, Don Paarlberg, Dale E. Hathaway and others make arguments in line with George F. Warren and Frank A. Pearson saying that farmers are better off if the government stops intervening in agricultural markets and concentrates on creating and maintaining stable monetary and fiscal policies and economic growth. The other group of agricultural economists like D. Gale Johnson, Glenn Johnson, Willard W. Cochrane, and Luther Tweeten to some extent and others tends to support the existing farm policy, by arguing for supply management and price support.

During the 1970s and early 1980s the scientific crisis in agricultural economics set in. This crisis was influenced by international turbulence starting with a food crisis in the 1970s, a trade crisis in agricultural markets in the beginning of the 1980s, and an international farm policy crisis in the mid-1980s. The commodity price boom of the 1970s had a positive influence on farm policy transfers in OECD countries. Also in the United States policy prices were increased in response to decreasing pressure on the national budgets together with removal of acreage control. The supply response was clear. Agricultural production increased throughout the period. Also world demand increased in this period. World grain trade for example doubled from 101 to 203 million metric tons between 1971 and 1980 (Hathaway, 1987 p. 8). Both agricultural economists and other institutions like the World-Watch Institute and the Club of Rome predicted food shortages and rising real prices. In retrospect the empirical evidence only identify one year in the 1970s with a fall in supply. The policy response to the situation around the world was an increase in price support (Josling et al., 1996 p. 103). Commodity prices decreased from 1981 to 1986. The reasons were declining international demand due to the debt crisis and favorable global weather combined with the area expansion of the 1970s and a strong dollar which rose by 40 percent in relation to other major currencies. The latter of course priced exports out of foreign markets and encouraged imports (Josling, 1998 p. 104).

In 1973, D. Gale Johnson published *World Agriculture in Disarray*. In this book he argues that domestic agricultural policy has a negative effect on world markets. The surplus from agricultural production in the United States and other rich countries is dumped on the world market. This transfers the need of structural adjustment to farmers in mainly developing countries. Not only is the international economy distorted by farm support, also the domestic economy has to suffer from economic welfare losses. One of the most important reasons for this is according to Johnson that the high degree of farm support in the industrialized world has distorted the location of agricultural production. A world without protection would have a completely different location of production. Although he argues for policy reform he does not go all the way. His policy recommendations include equal education for rural and urban youth, policies to increase off-farm mobility, income support to poor farmers and reductions in price support to an internationally agreed level. In support of the importance of the international dimension, G. Edward Schuh published *The Exchange Rate and US Agriculture* in 1974 about how the international macro-economy through the exchange rate influences American agriculture. He argued that the overvalued dollar undervalued the resources of American agriculture in relative terms. The conclusion is that the development of agriculture can be explained by development in the exchange rate rather than of government programs In 1979, Schuh released *The New Macroeconomics of Agriculture* .in which he stressed the important linkages between agriculture and the macro-economy. The works of Schuh were not radical new in the same way as Johnson's work. The turbulent decade of the 1970s with the breakdown of Bretton Woods, the energy crisis and high inflation gave the empirical evidence for important linkages between the macro economy and agriculture. The work of both Schuh, Johnson and among others McCalla and Josling (1981) and the general political concern about the wellbeing of the global economy made it possible to place agriculture on the agenda in the Tokyo-Round under GATT from 1973-1979[7].

5. The Domestic and Global Welfare Approach, 1982-

The crisis in world agricultural markets and farm policy in the beginning of the 1980s forced the politicians of the industrial countries to act. Some countries were more enthusiastic than others. The United States, due to its status as net exporter were eager to solve the deep problems of agriculture and trade. At a ministerial meeting in OECD in 1982 the member countries placed a mandate on the Committee for Agriculture and Trade to prepare the way for international negotiations on agricultural trade through a study of the facts. This study was to have two elements. *Firs*t, the sources of assistance on a commodity-by-commodity basis in all OECD countries would be quantifying and *second*, a method would be developed for assessing the impact of a progressive and balanced reduction in assistance upon domestic and international markets that would permit the incorporation of inter-commodity linkages and would allow an assessment of the different ways in which agricultural policy objectives could be met. OECD based this work on two analytical tools. The rate of assistance provided for agriculture in individual countries was to be analyzed using the concept of Producer Subsidy Equivalence

[9] The most important achievement in relation to agriculture in the Tokyo-Round was the inclusion of agriculture in multilateral trade negotiations. Since the beginning of GATT in the late 1940s agriculture had never been subject to any serious talks. The actual result of the round was weak. Two new Commodity agreements were made for beef and dairy.

(PSE) developed in the 1970s in a FAO study. The PSE is an estimate of the share of support in the value of agricultural production calculated by commodity. The quantitative impact of policies on trade and impact of different alternative scenarios was to be estimated with the help of a multi-commodity trade model developed within the OECD Agricultural Directorate (Cahill and Legg, 1990; Josling et al., 1996). Throughout the 1980s this theoretical work developed and in 1987 the first results were made public in a long series of publications on farm policy in OECD countries and the impacts on world trade. In the individual OECD countries this created a national pressure on authorities to mach the apparatus of the OECD to increase national influence on the agenda.

The current period of the domestic and global welfare approach evolved out of this setting during the 1980s. The general wisdom or normal science in this current period uses welfare economic theory and focuses on government failure in agricultural policy and advocates reform. The main argument is that traditional policy instruments create distortions in the national and international economy as well as enormous transaction costs. Furthermore, traditional agricultural policy instruments fail to increase the farmer's income mainly because they are capitalized in land prices in the long run. In the short run traditional support fuels production because large production means large subsidies. The result is that large and highly effective producers benefit most. This is in contrast to the income distribution objective of American farm policy. Compared to both the farm management approach and the farm problem approach this current period is highly mathematic and very model oriented. Liberalization scenarios are centrally placed in the international academic debate on agricultural policy. There is consensus on that free trade and globalization will result in net global welfare gains. The major textbooks on agricultural policy issues are Bruce L. Gardner's *The Economics of Agricultural Policy* from 1987, Luther Tweeten´s *Farm Policy Analysis* from 1989 and D. Gale Johnson's second and enlarged edition of *World Agriculture in Disarray* from 1991. These books deal with economic welfare analysis as central in agricultural policy analysis and incorporate agriculture linkages to the national and international economy.

In a survey article in the Journal of Economic Literature from 1992 Bruce L. Gardner summarizes the domestic and global welfare approach (Gardner, 1992). He questions the farm problem model and argues that the models explanatory powers have failed because empirical evidence shows that the income problem in agriculture has disappeared. He also argues that all empirical evidence to support the model was average data which means those different types of farms producing different types of products are added together and when aggregated supports the farm problem. One of his conclusions is that the farm sector is indeed very heterogeneous and must be treated that way. Another and more important conclusion is that traditional farm policy has had little to do with the disappearance of the income problem. The solution of the income problem is the result of the development over the years of functioning factor markets. Farm policy has in fact interfered with this process and thus traditional farm policy must in that respect be analyzed as government failure.

The 8th round of multilateral trade negotiations under GATT (General Agreement on Tariffs and Trade) began in December 1986 in Punta Del Este in Uruguay. Agriculture was for the first time the major topic on the agenda. According to Josling et al. (1996) the sense of crisis in agricultural policies was widespread in the mid 1980s. It was the subject of considerable

academic discussion and quantitative analysis. For a summary of these studies see World Bank (1986) and Sanderson (1990). The political response was to develop both domestic and international approaches to the problem. The main reason to include agriculture in the 8th GATT round was the opinion that domestic agricultural policy was responsible for the chaos in world agricultural trade. The link between domestic farm policy and international trade seems obvious but the negotiations went on for more than eight years not ending before late 1993. The Uruguay Round Agreement on Agriculture (URAA) places pressure on the member countries for reform of both agricultural policy and agricultural trade policy. In short URAA contains three constraints. Export subsidies have to be reduced, market access has to be better and domestic farm subsidies must be changed from coupled to decoupled support. The overall results of the URAA are pretty much in line with academia though many economists had hoped for more direct trade liberalization. The implementation of the agreement is not (Walter-Jorgensen and Jensen, 2001; Abbott, 2002). The new Doha-Round of multilateral trade negotiations under WTO began in November 2001. The agenda for the agricultural part of this were set in the URAA. It is still too early in time to sense any directions of results. Agricultural economists have already published both positive and normative research in trying to promote further reform of domestic agricultural policy.

It is too early to say that there is a new scientific crisis under way in the science of agricultural policy but there is a tendency towards a new direction. The approach is still economic welfare theory. The focus though has shifted from the aspects of government failure to the recognition of government having a role to play in agriculture correcting market failure. These market failures can be a result of market power, economics of scale, imperfect information, public goods and externalities. In this line of thought agriculture not only produces food bur a variety of less material and often non-traded goods like soil and landscape preservation, food security, animal welfare, rural development etc. Agricultural production also creates both positive and negative externalities. When externalities exist the private optimum in a free market may not be the social optimum. Hence support of producers of public goods and positive externalities and taxes for producers of e. g. pollution are needed to adjust the market. In some European countries like Norway there is a long tradition of research in multi-functionality agriculture. Trade oriented agricultural economists have for a long time advocated against policy founded in multi-functionality. The argument has been that this was just another way of protectionism (Bredahl, 2001). In recent years there has been a slight change in the approach to research in the substance of multi-functionality and agriculture on one hand and what is the society's willingness to pay for this on the other (Paarlberg et al., 2002; Randall, 2002; Freshwater, 2002).

6. Driving factors inside and outside the science of agricultural policy

In the strict Kuhnean case (Kuhn, 1962) the three above mentioned periods in agricultural policy research can obviously not be categorized as paradigms. For this to be true each paradigm needs its own theoretical foundation with no linkages between them. This has not been the case. Throughout the years the theoretical approach or the hard core has been built on the rationality of neo-classical economics. This rationality has developed from period too period indicating that the identified periods can be categorized as scientific research programs (Lakatos, 1970). The above stories in section 3, 4 and 5 indicate two important insights. *First*, the historical context had a major influence on the development of the theoretical approach to agricultural policy.

Second, that agricultural economist in the evolving stages of the science and some even later on in the process have had a strong bias toward the farming community. The loose Kuhnean case (Kuhn, 1970) gives in to the views of Lakatois but remains certain of some aspects of irrationality in the shifts between programs. This is probably true in the case of agricultural policy.

In the period of the farm management approach the whole nature of the institutional set up of the land-grant system had an enormous bias towards the farm sector. From the closing of the frontier in 1890 until 1920 American agriculture prospered (Cochrane, 1993 pp. 99-100). Agricultural economists, general economists and politicians believed in a laissez-faire role of the government in not steering the economy. When first the farm crisis and later the great depression became a reality in the 1920s and 1930s both economists and politicians were paralyzed for a very long time. Out of this evolved two scientific research programs in agricultural policy. These two programs competed until the end of the period of the farm problem approach in the beginning of the 1980s. One program followed in the footsteps of the founding fathers of agricultural economics. This program argued for specific farm solutions dealing with the problems inside agriculture. The other program argued that the farm sector was just another sector in the economy and that government's role was to stabilize monetary and fiscal policy so all sectors had a chance to adjust over time. The former program succeeded in 1933 in the sense of having a major influence on the New Deal legislation for agriculture and continued throughout the period of the farm problem approach to do research and make policy recommendations in this tradition.

In the 1970s the scientific research program started to degenerate. This was mostly in response to contradictive empirical evidence. The latter program converges throughout the period of the farm problem approach towards general economics and stayed progressive. During the 1980s this progressive program took over the relevant bits and pieces of the degenerating program. In the period of the domestic and global welfare approach there was only one scientific research program in agricultural policy. What drove these two schools of thought and why did one of them disappear? Bruce L. Gardner was the first to address this question in 1992 in *Changing Perspectives on the Farm Problem*. Some years later he extended these issues in a chapter in a book from 1996 honoring of D. Gale Johnson called *Why Experts in the Economics of Agriculture Have Changed Their Policy Tune*. He argues that D. Gale Johnson, Willard W. Cochrane, and Luther Tweteen throughout the period identified in this paper as the farm problem approach advocated price support as being part of the solution to the farm problem (Johnson, 1947, 1973; Cochrane, 1958; Tweteen, 1970 p. 357, 1979 p. 518). In the period of the domestic and global welfare approach identified in this paper all three of them have changed their policy song and do not include price support in policy recommendation (Johnson, 1991 p. 295; Cochrane, 1985 p. 1007; Tweteen, 1989 p. 419). According to Gardner (1992) and (1996) there was no evidence in their work that indicated any form of self-interest or change in their normative views of farm policy. Instead he turns to changes in their view of positive economics. The great depression still influenced the way many economists thought of the economy. They had no confidence in laissez-faire economics and believed deeply that government had an active role to play in macroeconomic steering. In agriculture the effects of the great depression were enormous and here is the link to the farm problem model because macroeconomic instability in a sector with inelastic demand and supply conditions creates enormous fluctuations in farm prices. As the years went by it was clear for everyone that government interfering was not always a

success and this was extremely true in the case of farm policy. All three of them ended up publishing important contributions in this current period of the domestic and global welfare approach. The problem with Bruce L Gardner's analysis is that he does not consider those who did not change their policy recommendations. People like George F. Warren, Frank A. Pearson, Theodore W. Schultz, Don Paarlberg and others also experienced the Great Depression. They also stopped believing in laissez-faire but their advice was intervention in general fiscal and monetary policy not in agriculture. This indicates strongly that Gardner's first impression was right. It has something to do with the understanding of positive economics. Because as mentioned in section 2 to be able to say *what could be* one needs to know *what is*. The latter group of agricultural economists understood the economics of agriculture decades before the former group.

Beliefs and values of agricultural economists matters (Pope and Hallam, 1986). One of the most influential factors in the development of both the theoretical approach to agricultural economics and policy and the rationale for political intervention in agriculture in America is in its extreme form what has been called Agrarian/Farm Fundamentalism or Agricultural Populism (Buck, 1920; Davis, 1935; Paarlberg; 1989; Tweeten, 1989; Gardner, 1995). The rationality of this movement is based on an agrarian creed that among others states three fundamental beliefs. *First*, that agriculture is the most basic occupation in American society, and that all other occupations depend on it. *Second*, that farmers are better citizens, have higher morals, and are more committed to traditional American values than are other people and therefore indeed the moral and social character of the nation depends on farmers. *Third*, the family farm must be preserved because it is a vital part of the American heritage and the ideal nuclear family unit where the family works, plays and preys. The origin of these fundamentalist views were founded in a time when farming was the major source of the nation's wealth, most of the people lived on farms, and the small family farm was the most efficient economic unit (Tweeten, 1989 pp. 73-74). Agrarian fundamentalism found proof in the Bible and in writings and speeches by prominent people like Thomas Jefferson and William Jennings Bryan[8]. In a more mild and moderate form the agrarian movement had an influence on rural America. The land-grant system was set up in rural areas of the country. The young people came right off the fields to study agronomy and agricultural economics. It is obvious that these men and women maintained a bias towards agriculture. At the turn of the century agriculture's importance for the American economy was a fact not an illusion. These economists played a big role in the development of USDA, the Bureau of Agricultural Economics, land grant universities and the New Deal legislation for agriculture.

Two important things happen during the last two-thirds of the 20th century in respect to the power of farm fundamentalism in agricultural policy. *First*, agriculture became less and less important for the American economy, fewer and fewer people lived on farms and in rural areas. For the farming community this did not change anything. They stood together as one interest group lobbying the political system for keeping up intervention and farm support. For the rest of the society, the consumers and taxpayers of America, it meant that they either could not or did not found it worth the effort to lobby the political system. The group was too big and too heterogeneous and therefore they never formed a interest group against farm subsidies. Another

[10] For a quick overview of farm fundamentalism see Tweeten (1989). For a deep and comprehensive analysis see Buck (1920) and/or Davis (1935).

important insight is when non-farm people are asked about farm policy they always seem to be in favor (Tweeten, 1989). This is difficult to explain but may have something to do with heritage and romantic beliefs about farming in the old days. The *second* important thing that happened was the quantification of agricultural economics and its increased theoretical rigor. The applied science of agricultural economics became more quantitative and theoretically oriented in response to the demands from general economics and academia. To be accepted in scientific societies with research papers accepted at conferences and published in journals. Agricultural economics became more and more a discipline of economics and mathematical analysis. Thus, farm fundamentalism was slowly crowded out[9].

7. Conclusion

This paper identified three scientific research programs in the historical development of agricultural economics in America. The farm management approach from 1870-1933, the farm problem approach from 1933-1982 and the domestic and global welfare approach from 1982 to current time. The farm management approach evolved out of the land grant system and concentrated on production and management. In respect to agricultural policy no specific research program can be identified in that period. During the great farm crisis of the 1920s a scientific crisis in agricultural economics sets in and two competing policy research programs are established. One program argues for intervention in agriculture and the other one for intervention in the general economy. Throughout the period of the farm problem approach both programs are progressive and the competition continues until the late 1970s. The former research program degenerates in the 1970s and the latter picks up the bits and pieces. This program stays progressive throughout the period of domestic and global welfare approach by adding the international dimension and applying economic welfare analysis in agricultural policy research.

The historical context had an enormous influence on the development of agricultural economics and policy. Since economics being a social science this is not a big surprise. Research in economic policy, hence agricultural policy, deals with issues that are relevant in time and space and of course values and beliefs of economists matter. Agricultural economics was from the beginning an applied science. The unique land grant system created interactions between the farmers and researchers through research and extension. This establishes an atmosphere in the institutional set up which was biased toward helping farmers by all means. The two competing research programs both have their roots in this setting. They cared for farmers and farming as a way of life. They both saw the great depression as the end of laissez faire governance. The big difference between the two programs was the understanding of positive economics. After 1982 there has been only one scientific research program in agricultural policy. This program has converged strongly towards general economics and places all analysis of agricultural policy in the context of welfare economic analysis.

[11] These two counter arguments give us some insights on the gap between policy recommendation from agricultural economists and the actual farm policy followed by politicians. Farm fundamentalism is still strong in farm communities and their political delegates. And farm lobbying due to farmers common interests are very successful in advocating status quo.

References

Abbott, Philip (2002). "Tariff-rate quotas: Failed market access instrument" *The European Review of Agricultural Economics*, Volume 29, Number 1, pp. 109-130.

Benedict, Murray R. (1953). "*Farm Policies of the United States, 1790-1950 – A story of their origin and development*". The Twentieth Century Fund 1953. New York.

Black, John D. (1926). "*Introduction to Production Economics*". Henry Holt & Co 1926. New York.

Black, John D. (1929). "*Agricultural Reform in the United States*". MacGraw-Hill 1929. New York.

Blaug, Mark (1985). "*The methodology of economics or how economists explain*". Cambridge Surveys of Economic Literature. Cambridge University Press 1985. Cambridge.

Brandow, G. E. (1977). "Policy for Commercial Agriculture, 1945-1971". In Martin, L. R. (eds.). "*A Survey of Agricultural Economics Literature-Volume 1*". University of Minnesota Press 1977. Minneapolis.

Buck, Solon I. (1920). "*The Agrarian Crusade*". Oxford University Press 1920. Oxford

Cochrane, Willard W. (1993). "*The Development of American Agriculture, A Historical Analysis*". Second Edition. University of Minnesota Press 1993. Minneapolis.

Cochrane, Willard W. (1958). "*Farm Prices, Myth or Reality*". University of Minnesota Press 1958. Minneapolis.

Davis, Joseph S. (1935). "Agricultural Fundamentalism". In Himes, Norman E. (eds.). "*Economics, Sociology and the Modern World*". Harvard University Press 1935. Cambridge.

Ely, Richard T. (1937). "*Outline of Economics*". The MacMillian Co 1937. New York

Faulkner, Harold U. (1964). "*American Economic History-Eighth Edition*". Harper & Row 1964. New York.

Finegold, Kenneth (1981). "From Agrarianism to Adjustment: The Political Origins of New Deal Agricultural Policy". *Politics and Society* Volume 2, No. 1. pp. 1-27.

Fox, Karl A. (1988). "Agricultural Economics". *Palgraves Dictionary of Economics*, Volume 1, pp. 55-62.

Freshwater, David (2002). "A U.S. Perspective on Multifunctionality". Proceedings from the Xst EAAE Congress in Zaragoza, Spain 2002.

Cahill, Carmel & Wilfrid Legg (1990). "*Estimation of Agricultural Assistance using Producer and Consumer Subsidy Equivalents: Theory and Practice*". OECD Economic Studies No. 13. Paris.

Galbraith, John Kenneth (1979). "*The Great Crash 1929"*. Houchton Mifflin Company 1979. Boston.

Gardner, B. Delworth (1995). "*Plowing Ground in Washington, the political economy of U.S. agriculture*". Pacific Research Institute for Public Policy 1995. San Francisco.

Gardner, Bruce L. (1987). "*The Economics of Agricultural Policy"*. Macmillan Publishing Company 1987. New York.

Gardner, Bruce L. (1992). "Changing the Economic Perspectives on the Farm Problem". *Journal of Economic Literature* Vol. XXX, No. 1, March 1992. pp. 62-101.

Gardner, Bruce L. (1996). "Why Experts on the Economics of Agriculture Have Changed Their Policy Tune". In Antle, John M. & Daniel A. Sumner (eds.). "*Papers in Honor of D. Gale Johnson*". The University of Chicago Press 1996. Chicago

Hathaway, Dale E. (1987). "*Agriculture and the GATT - Rewriting the rules*". Institute for International Economics1987. Washington D. C.

Hathaway, Dale E. (1963). "*Government and Agriculture - Economic Policy in a Democratic Society*". The Macmillann Company 1963. New York.

Heady, Earl and Edwin O. Haroldsen and Leo W. Mayer and Luther G. Tweeten (1965). "*Roots of the Farm Problem*". The Iowa State University Press 1965. Ames.

Ingersent, Ken A. and A. J. Raynor (1999). "*Agricultural Policy in Western Europe and the United States*". Edward Elgar 1999. Northampton.

Johnson, D. Gale (1973). "*World Agriculture in Disarray*". For the Trade Policy Research Center, London. Macmillan Press 1973. New York.

Johnson, D. Gale (1947). "*Forward Prices for Agriculture*". The University of Chicago Press 1947. Chicago.

Johnson, D. Gale (1991). "*World Agriculture in Disarray, Second Edition*". For the Trade Policy Research Center, London. Macmillan Press 1991. New York.

Josling, Timothy (1998). "*Agricultural Trade Policy: Completing the reform*". Institute For International Economics 1998. Washington D. C.

Josling, Timothy and Stefan Tangermann and T. K. Warley (1996). "*Agriculture in the GATT*". Macmilian Press Lts. 1996. London.

Kindleberger, Charles P. (1986) "*The World in Depression, 1929-1939*". University of California Press 1986. Berkeley.

Kuhn, Thomas S. (1962). "*The Structure of Scientific Revolutions"*. The University of Chicago Press 1962. Chicago.

Kuhn, Thomas S. (1970). "*The Structure of Scientific Revolutions, Second Edition, Enlarged*". The University of Chicago Press 1970. Chicago

Lakatos, Imre (1970). "Falsification and the Methodology of Scientific Research Programmes". In Lakatos, Imre & Alann Musgrave (eds.). "*Criticism and the Growth of Knowledge*". Cambridge University Press 1970. Cambridge.

Lakatos, Imre (1978). "*The Methodology of Scientific Research Programs*". Philological Papers 3. Cambridge University Press 1978. Cambridge.

Lakatos, Imre and Musgrave (1970)."*Criticism and the Growth of Knowledge*". Cambridge University Press 1970. Cambridge

Larsen, Arne (1994). "Economists and Politics". *European Review of Agricultural Economics* Volume 21, 1994, pp. 351-356.

Lewis, W. Arthur (1963). "*Economic Survey 1919-1939*". Unwin University Books 1963. London.

McCalla, Alex F. and Timothy E. Josling (1981). "*Imperfect markets in agricultural trade*". Allanheld, Osmun 1981. Montclair.

Nourse, E. G. (1916). "*Agricultural Economics - A selection of materials on which economic principles are applied in the practice of agriculture*". University of Chicago Press 1916. Chicago.

Paarlberg, Don (1964). "*American Farm Policy, A Case Study of Centralized Decision Making*". John Wiley & Sons 1964. New York.

Paarlberg, Don (1984). "Tarnished Gold, US farm commodity programs after 50 years". *Food Policy*, February 1984, pp. 6-10.

Paarlberg, Don (2002). "Personal Interview". West Lafayette, Indiana 47906, USA

Paarlberg, Philip L. and Maury Bredahl and John G. Lee (2002). "Multifunctionality and Agricultural Trade Negotiations". *Review of Agricultural Economics*, Volume 24, Number 2, pp. 322-335.

Paarlberg, Robert L. (1989). ' The Political Economy of American Agricultural Policy, Three Approaches". *American Journal of Agricultural Economics*, Volume 71, Number 5, pp. 1157-1164.

Pope, Rulon D. and Arne Hallam (1986). "A Confusion of Agricultural Economists? - A Professional Interest Survey and Essay". *American Journal of Agricultural Economics* 68, pp. 572-594.

Randall, Alan (2002). "Valuing the outputs of multifunctional agriculture". *European Review of Agricultural Economics*, Volume 29, Number2, pp. 289-307.

Rasmussen, Wayne D. and Gladys L. Baker, James S. Ward (1976). "*A Short History of Agricultural Adjustment, 1933-1975*". Economic Research Service, United States Department of Agriculture 1976. Washington D. C.

Sanderson, Fred H. (1990). "*Agricultural Protectionism in the Industrialized World*". Resources for the future. Washington D. C.

Schuh, G. Edward (1976). "The New Macroeconomics of Agriculture". *American Journal of Agricultural Economics*, December 1976, pp. 802-811.

Schuh, G. Ecward (1974). "The Exchange Rate and US Agriculture". *American Journal of Agricultural Economics*, February 1974, pp. 1-13.

Schultz, Theodore W. (1945). "*Agriculture In An Unstable Economy*". McGraw-Hill Book Company, Inc. 1945. New York.

Taylor, Henry C. (1905). "*Agricultural Economics*". Macmillan 1905. New York.

Taylor, Henry C. and Anne D. Taylor (1952). "*The Story of Agricultural Economics in the United States, 1840-1932*". The Iowa State College Press 1952. Annes.

Turner, Frederick Jackson (1920). "*The Frontier in American History*". Henry Holt and Company 1920. New York.

Tweeten, Luther (1989). "*Farm Policy Analysis*". Westview Special Studies in Agricultural Science and Policy. Westview Press 1989. Boulder.

Tweeten, Luther (1979). "*Foundation of Farm Policy*". University of Nebraska Press 1979. Lincoln.

Tweeten, Luther (1970). "*Foundation of Farm Policy*". University of Nebraska Press 1970. Lincoln.

Tweeten, Luther and Stanley R. Thompson (2002). "*Agricultural Policy for the 21st Century*". Iowa State Press 2002. Ames.

USDA (1922). "*United States Department of Agriculture - Year Book 1922*". United States Department of Agriculture 1922. Washington D. C.

USDA (1962). "*United States Department of Agriculture - Year Book 1962*". United States Department of Agriculture 1962. Washington D.

Walter-Jorgensen, Aage and Trine Vig-Jensen (2001). "The CAP and the international trade negotiations". SJFI Report Number 123. Copenhagen.

Warren, George F. (1913). "*Farm Management*". MacMillian Press 1913. New York.

Warren, George F. and Frank A. Pearson (1924). "*The Agricultural Situation, Economic Effects of Fluctuating Prices*". John Wiley & Sons 1924. New York.

Warren, George F. and Frank A. Pearson (1933). "*Prices*". John Wiley & Sons 1933. New York

Warren, George F. and Frank A. Pearson (1935). "*Prices and Gold*". John Wiley & Sons 1935. New York

World Bank (1986). "*World Development Report,1986*". Oxford University Press 1986. Oxford.