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CLUB OF BOLOGNA

**PROCEEDINGS
OF THE 4th MEETING
OF THE FULL MEMBERS**

Bologna
4-5 November 1992

XXIII EIMA

Conclusions and Recommendations
Conclusioni e Raccomandazioni

Opening Session

Special Lecture

GATT and Agriculture:
Consequences for Mechanisation and Related Industries

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Energy from Agriculture

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Bangkok, Thailand - December 7, 1992

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**CONCLUSIONS
AND RECOMMENDATIONS**

The Club of Bologna met on 4th and 5th November, 1992 with the participation of 47 experts from 20 countries and discussed the following topics in depth:

- i) GATT and Agriculture: Consequences for Mechanisation and Related Industries;
- ii) Energy from Agriculture;
- iii) Transfer of Technologies in Agriculture;
- iv) Contractors in Agriculture: Consequences and Developments on Agricultural Machinery. A Preliminary Analysis.

Conclusions and Recommendations

1. GATT and Agriculture: Consequences for Mechanisation and Related Industries

The General Agreement on Tariffs and Trade (GATT) in agriculture which will cover a period of 10 years aims to reduce protectionist practices which for years have been distorting the agricultural production systems in many countries and are greatly impeding the opening of their economies to world agricultural commodity markets. Many modifications of domestic policies are now starting to take place to reduce these distortions. The GATT Agreement will lead to harmonization of world markets and will produce long-term beneficial results for world agriculture.

The significant changes expected will lead to a shift in production of some commodities such as cereals and oil seeds to areas with lower production costs. The gradual elimination of barriers to free market conditions will have an impact on the supply and demand of tractors and farm machinery. This trend will cause a gradual shift in the production of machinery and components towards countries which can be more competitive. Furthermore, the shift in some agricultural production to-wards low-cost countries will have a significant impact on farm structure, resulting in major changes in world wide machinery demand.

In the industrialized countries the reduced purchasing power of farmers has greatly

shrunk the farm machinery market. However the expected geographical shift in production of some crops and possible structural reforms in agriculture as a result of customs barrier reductions may result in increased demand for some machinery in some areas. New opportunities for specialised agricultural machinery can result from: the cultivation of new and alternative crops; the need to increase environmental protection and the quality of the product; the need to manage rural areas not devoted to direct agricultural use and the development of more sustainable agricultural practices.

On the basis of the above considerations the participants:

- recommend a thorough review of all forms of mechanisation required under the changing circumstances in agriculture under GATT. This will assist in identifying new outlets for high-quality, highly competitive, traditional machinery on the one hand, and more sophisticated, technically advanced machinery on the other. This need will be felt more in European Community and in Japan than in the USA where starting conditions will make adjustment to the GATT agreement much easier;
- underline the need to encourage co-operation among manufacturers in order to sustain larger, more efficient production units. In the future two main levels of mechanisation technology will predominate:
 - large capacity, high technology tractors and equipment for large efficient farming units, contractors and part-time farmers, which will probably be developed by the established manufacturing companies;
 - standard technologies to be supplied by manufacturers in developing countries; recognise that a great opportunity will be offered in the medium to long-term by the markets of Eastern Europe be-cause of the agrarian reform just beginning there and the lower cost of agricultural production;
- recommend serious consideration of the opportunity presented in the medium

and long-term by the developing countries. This will be both as markets and as a location for local production through joint-ventures to produce tractors and farm machinery that will through lower manufacturing costs become competitive in developed countries as well as developing countries;

- highlight the need to improve infrastructure and establish joint-ventures among various manufacturers to produce machine components.

2. Energy from Agriculture

2.1 - An analysis of the various types of fuel obtainable from biomass with assessments of their mass and energy balances has confirmed that the most viable options are:

- for gaseous fuels: pyrolysis and gasification of lignocellulosic biomass for the production of gases with a lower calorific value (LCV) of around 5.6 MJ/m³ and a total output/input energy ratio in the order of 2.8; anaerobic fermentation of biomass can produce gas with an LCV of about 25-30 MJ/m³ and a total output/input ratio of just over 2;
- for liquid fuels: extracting and esterifying vegetable oils offers a fuel with characteristics rather similar to diesel oil and thus useable in current engine types with a total output/input energy ratio of 2.4 (including the value of by-products); the use of unrefined vegetable oils for external combustion engines with similar output/input ratios; in some cases ethanol extraction based on existing integrated systems can be viable in some regions;
- for solid fuels: the direct combustion of lignocellulosic biomass in burners for drying, heating and in steam boilers driving electrical generators or fuelling external combustion engines with a total output/input energy ratio that may exceed 3.

In economic terms, however, there is greatest interest in the production of biodiesel and

in direct combustion, even though the costs are still far from competitive with mineral fuels.

2.2 - To improve the potential for increased use of renewable energy sources for engine fuels the participants recognise the need for the development of appropriate engine designs which take account of:

- the close relationship between engine design and fuel specification;
- the need to control environmental pollution;
- the need for co-operation between the developed and developing countries.

Thus there is a need to consider improvements to current internal combustion engine designs to make them compatible with the current needs of agricultural markets world wide. In the medium term the principal requirement is for an operationally flexible technology capable of producing mechanical energy for stationary and mobile use. This suggests that the main renewable energy sources that should be developed are vegetable oils to be used refined in diesel engines; alcohols to be used pure or blended with gasoline in Otto cycle engines; raw oils, alcohols and lignocellulosic biomass to be used in external combustion engines and directly for heating and drying.

Market studies will be required to identify and quantify the potential for different types of engine. Technologies for producing esterified oils for use in ordinary diesel engines is already available. Research on this energy source, in fact, began in 1973, resulting in practical achievements in Austria, Germany, USA and Italy. The EC has set up an ad hoc working group that in April, 1992 formulated specifications for esterified vegetable oils suited to existing diesel engines. These specifications will soon be embodied in a Community Directive.

However the participants acknowledged that success in the future use of bio-diesel will be strongly linked to external factors such as environmental and economic considerations. In particular whether oil seeds can be competitive

and profitable for farmers to produce. This will depend on the international prices of diesel fuel, including taxes and duties, the price of agricultural raw materials, and of refinery by products and the effect of agreements such as the GATT.

Given the current market situation however, the participants recommend that governments adopt measures that will offer significant economic support to the implementation of the various development programmes in the areas of both agriculture and industry. In fact the current ratio between the price of diesel oil and the price of esterified vegetable oil, at least in Europe, is in the order of 1:3. It is generally acknowledged that progress from genetic improvement in energy crops and the increased efficiency of processing plants will in future result in a significant reduction in the cost of production and processing of oil seeds.

As a general conclusion the participants recommend:

- an accelerated development of research programmes to obtain a significant improvement in the productivity of energy crops, particularly oil seeds and fast growing lignocellulosic species;
- the development of research programmes aimed at improving the efficiency of processing of energy crops; initiating research aimed at improving the utilization of bio-fuels through:
 - low cost simplified Otto cycle engines designed to run on bio-alcohol;
 - simplified Diesel engines specifically designed to run on crude vegetable oils;
 - external combustion engines operating on various types of renewable fuel;
 - continued research on electrical generation systems from biomass.

3. Transfer of Technologies in Agriculture

Discussion of this topic centred around two case histories.

3.1 - The case of Deutz in Algeria - A joint-venture for manufacture engines and tractors

in Constantine was signed between KHD, Germany and the Algerian Government in 1969. This was within the framework of the Government's plants for the development of industry and agriculture. In 1974 tractor production started and to date a total of 100,000 tractors have been produced with an average local content of approximately 80%.

The main difficulties met during these 18 years were:

- lack of planning ability of the local middle management;
- insufficient maintenance of the plant;
- insufficient flexibility in parts supply;
- lack of local medium sized supplying industries.

Nevertheless the project enabled Algeria to develop an industrialization programme and to substantially increase the level of education and professional training. The future potential of this enterprise depends on its ability to maintain competitive labour costs and production quality standards and to improve access to markets within the Third World, as well as compete as a supplier to industrialized countries.

3.2 - The case of threshers in Egypt - The paper described the development and commercialization of a dual mode thresher which can be used for all cereal crops grown in the developing countries and can make animal feed from wheat straw when threshing. This is a unique problem in many semi-arid developing countries where wheat and rice are grown in rotation and wheat straw is used for animal fodder.

The experience gained in introducing this new technology in Egypt emphasises the importance of:

- the careful assessment of the needs and demands of farmers, as well as manufacturers, to ensure that the new technology is appropriate to local conditions;
- extensive local testing of machines under varying crop and field conditions;

- the development of machines by research institutions in close collaboration with manufacturers to enable rapid commercialization.

On the basis of the discussion and the information collected, the participants made the following recommendations:

- in establishing new manufacturing units, great importance should be given to the improvement of the support infrastructure such as component supply industries and education and research facilities. Governments should encourage collaboration between manufacturers and promote maintenance of better quality standards;
- manufacturers should be willing to accept new ideas and suggestions from outside;
- manufacturers should aim to supply quality products and once the market is established, to provide suitable after-sales service;
- manufacturers should aim to establish a market based on sales and distribution networks providing a service direct to farmers independently of government and without the need to depend on government purchases;
- manufacturers should ensure that they have adequate resources to survive until all the teething problems of new machinery have been solved and it is established in the market;
- medium-size local production units should be established with a strong desire to expand the volume of production and range of products;
- government and manufacturers should take a long-term view of business development without insisting on immediate profits;
- close collaboration between manufacturers and research and development institutes should be promoted;
- manufacturing companies in the industrialized countries wishing to promote technology transfer through joint ventures or other means should consider adaptation and improvement of existing

machinery in conjunction with the local manufacturer;

- technology transfer programmes should take account of criticism by local farmers and manufacturers and should promote extensive field demonstrations in the local marketing area;
- manufacturing enterprises should undertake thorough market surveys and test the markets with new products in limited volume before embarking on large scale manufacture;
- private sector development of manufacturing enterprises with minimal government involvement has generally proved to be more effective than state or government controlled programmes.

4. Contractors in Agriculture: Consequences and Developments on Agricultural Machinery. A Preliminary Analysis

Two reports were presented on the contracting which is one of the most common forms of the multi-farm use of agricultural machinery. The first dealt with the industrialized countries and the second with developing countries.

4.1 - In the industrialized countries the participants recognised that in many cases agriculture has to face a lack of labour as well as an excess capacity of farm machinery. This creates difficulties in the carrying out some agricultural operations and also results in under-utilization of tractors and implements and increases overall costs.

This justifies the development and reinforcement of the role of contractors as one of the possible solutions. The situation in Spain and Italy has been studied, revealing the increased importance of this phenomenon which has been developed spontaneously and without any government control.

In the case of Italy most of the contractors are family enterprises (total installed power less than 200 kW) which play an important role carrying out many field operations in both small and big farms. The main activities are

ploughing, seed bed preparation and harvesting (mainly cereals).

However the costs of such contract services vary considerably from one country to another. For example in the State of New York (USA) the cost of services supplied by contractors are approximately 40% lower than in Northern Italy. This seems to relate to the difference in farm size, as well as to the different level of utilization of the various machines. While in the State of New York contractors work within a radius of up to 50 km and more, in the European Community very seldom does the area reach a radius of 10 km.

On the basis of a sensitivity analysis of the technical and economic aspects of mechanisation, the role of contractors has been clearly pointed out. Larger contractor units are likely to be more economical and will be able to offer services at more acceptable charging rates. The participants also emphasise the need for machinery and equipment specifically designed for use by contractors, with the aim of achieving further cost reductions and improvement in the quality of work.

4.2 - In the case of the developing countries the participants acknowledge that given the current trend toward a gradual reduction in manpower and the pattern of peak labour requirement periods, the utilization of agricultural contractors is destined to play a growing role. This is because:

- it promotes the use of modern machinery that can improve the quality of the various field operations and consequently increase productivity;
- it avoids unnecessary high capital investments for individual farmers;
- it can reduce the cost to the farmer of some operations;
- it enables the timeliness of operations to

be improved, particularly when labour is short.

In the case of Jordan which was presented as a case study, over 50% of the farmers are part-time and farms are quite small. Various contractors already exist, including private, public and semi-private units. The case study showed that the cost of performing the various operations through contractors is much lower than the cost of the same operation carried out by individual farmers.

However contracting can decrease the over-all requirement for machinery and tractors if compared with the much larger number of units required for individual farmer ownership.

In conclusion the participants:

- acknowledged the important role that the multi-farm use of machinery plays in both the industrialized and developing countries;
- recommend that governments promote the rational development (including training and technical assistance) of private contractors equipped with suit-able machinery and that manufacturers promote the machinery types best suited in power, work capacity, work quality, design etc., for use by contractors under local conditions;
- governments should not be involved in operating conventional contract mechanisation services, but should limit their efforts to introducing new mechanisation technologies and providing adequate support infrastructure;
- as the subject is not sufficiently understood, the participants agreed on the need to go deeper into the topic at the next Meeting based on additional information from all participants, including details of other forms of multi-farm use of tractors and machinery.

CONCLUSIONI E RACCOMANDAZIONI

Il Club of Bologna riunitosi nei giorni 4 e 5 novembre 1992 con la partecipazione di 47 esperti provenienti da 20 paesi, ha approfonditamente discusso i seguenti argomenti:

- GATT e agricoltura: conseguenze per la meccanizzazione e le industrie collegate;
- energia dall'agricoltura: nuove opportunità tecnologiche;
- trasferimento di tecnologie meccaniche per l'agricoltura;
- ruolo delle imprese agromeccaniche di servizio: conseguenze sull'evoluzione delle macchine agricole;

pervenendo alle seguenti

Conclusioni e Raccomandazioni

1. GATT e agricoltura: conseguenze per la meccanizzazione e le industrie collegate

Le previsioni relative all'accordo GATT sull'agricoltura - che dovranno svilupparsi nell'arco di 10 anni dal momento di inizio della sua applicazione - sono orientate verso il progressivo calo delle pratiche protezionistiche attuate nei vari paesi. Tali pratiche hanno per anni distorto i sistemi agricoli produttivi dei paesi stessi condizionando pesantemente le possibilità di loro apertura ai mercati agricoli mondiali. Tuttavia, stanno per essere avviate modifiche significative nelle politiche economiche nazionali per ridurre gli impatti di queste distorsioni. Gli obiettivi dell'accordo GATT, peraltro, dovrebbero portare ad una armonizzazione del mercato mondiale e produrre - nel lungo termine - risultati positivi per il sistema agricolo mondiale.

Il profondo cambiamento che si prospetta porterà, come conseguenza, allo spostamento di talune produzioni - specie cerealicole e oleaginose - verso aree agricole a maggiore competitività economica. La progressiva eliminazione delle barriere al libero mercato, poi, sarà destinata ad avere un impatto anche sull'offerta e sulla domanda di trattori

e macchine agricole. Tale tendenza sarà destinata a causare, infatti, un graduale spostamento della produzione di macchine e componenti verso paesi a più elevata competitività. Inoltre, l'accennato spostamento di talune produzioni agricole verso paesi "a bassi costi" assumerà un significativo impatto sulle strutture aziendali di molti paesi industrializzati, il che comporterà l'esigenza di una riorganizzazione della domanda di macchine nel mondo.

Nei paesi industrializzati, la ridotta capacità di acquisto da parte degli agricoltori ha diminuito notevolmente, in questi ultimi anni, il mercato delle macchine agricole. Tuttavia, alcuni significativi aggiustamenti nell'industria potrebbero generare uno sviluppo del mercato se si terrà conto: dei previsti spostamenti geografici nelle produzioni vegetali; di possibili riforme strutturali dell'agricoltura a seguito della riduzione delle barriere doganali. Infatti, nuove opportunità per macchine agricole specializzate potranno essere offerte da: la coltivazione di specie nuove e alternative; la necessità di aumentare il grado di salvaguardia ambientale e la qualità dei prodotti; la gestione di aree rurali non direttamente destinate a usi agricoli; lo sviluppo di un'agricoltura sostenibile.

Sulla base di quanto sopra, i partecipanti:

- raccomandano un ripensamento delle forme di meccanizzazione, da un lato, la ricerca di nuovi sbocchi per macchine appropriate di alta qualità e di elevata competitività, dall'altro. Tale esigenza si manifesta con maggiore urgenza nella Comunità Europea e in Giappone che non negli USA ove le condizioni di partenza sono più favorevoli all'adeguamento all'accordo GATT;
- sottolineano la necessità di promuovere forme di cooperazione tra i costruttori di macchine agricole e di favorire l'incremento delle dimensioni delle varie unità produttive. Il futuro sarà favorevole allo sviluppo di due principali tipi di trattori e macchine agricole: tecnologie sofisticate e di elevata capacità di lavoro per le agricolture avanzate, i servizi agromeccanici e le aziende part-time, da

parte delle principali ditte già affermate nel settore; tecnologie standard da parte di costruttori insediati nei PVS al fine di coprire sia la loro domanda interna, sia - più in generale - le esigenze di svolgimento di operazioni in aziende agricole di tipo estensivo;

- riconoscono che una grande opportunità è aperta - nel medio-lungo termine - dai mercati dell'Est Europeo per la riforma agraria che si sta appena iniziando, tenuto conto anche dei minori costi di produzione dell'agricoltura in essi praticati;
- raccomandano di considerare le opportunità di mercato che si apriranno, nel medio-lungo termine, nei paesi emergenti per i quali la tendenza è verso la realizzazione in loco - mediante forme di cooperazione - di macchine agricole e trattori destinati a divenire competitivi anche sui mercati dei paesi sviluppati;
- evidenziano, infine, la necessità di migliorare le infrastrutture e lo sviluppo di joint-ventures fra costruttori per la produzione di componenti di macchine agricole.

2. Energia dall'agricoltura

2.1 - L'analisi compiuta sulle caratteristiche dei differenti tipi di combustibili ottenibili da biomasse, con relative valutazioni dei bilanci di massa ed energia, ha confermato che le opzioni più interessanti riguardano:

- per i combustibili gassosi: le tecnologie di pirolisi e gassificazione delle biomasse ligno-cellulosiche per la produzione di gas aventi un Potere Calorifico Inferiore (PCI) dell'ordine di 5.6 MJ/m^3 , con un rapporto energetico globale output-input di 2.7-2.9; le tecnologie per la fermentazione anaerobica di biomasse a basso rapporto C/N per produrre un gas con PCI di circa $20-25 \text{ MJ/m}^3$ offrendo un rapporto energetico complessivo appena superiore a 2;
- per i combustibili liquidi: le tecnologie di estrazione ed esterificazione di oli

vegetali offrenti un combustibile di caratteristiche assai vicine al gasolio ed utilizzabili come tali nella motorizzazione attuale, con un rapporto energetico globale output/input di 2.4 (incluso il valore energetico dei sottoprodotti); l'impiego di oli vegetali non raffinati per motori a combustione esterna, con analoghi rapporti out/in. In alcune regioni, anche l'estrazione di etanolo può considerarsi come un'opzione interessante;

- per i combustibili solidi: la combustione diretta di biomasse ligno-cellulosiche in caldaie per la produzione di calore e per l'essiccazione e/o di vapore azionante generatori elettrici o motori a combustione esterna, con un rapporto energetico globale output/input che può anche superare 3.

In termini economici, invece, si riconosce il maggiore interesse nella produzione di biodiesel e nella combustione diretta, anche se i costi sono tuttora lontani dalla competitività nei confronti dei combustibili minerali.

2.2 - Circa le prospettive che si aprono sui motori termici utilizzanti risorse energetiche rinnovabili, i partecipanti riconoscono, anzitutto, che i problemi legati all'attuale sviluppo motoristico sono connessi a:

- stretta dipendenza delle caratteristiche dei motori "standard" da combustibili con caratteristiche fisiche ben precise;
- inquinamento ambientale;
- cooperazione tra paesi industrializzati e paesi in via di sviluppo.

Da qui l'esigenza di considerare possibili alternative agli attuali motori a combustione interna e/o le possibilità tecnologiche per renderli compatibili con le esigenze attuali del mondo agricolo. Limitando l'analisi al medio termine, va tenuto presente che l'esigenza fondamentale è di disporre di una tecnologia operativamente flessibile, in grado di produrre energia meccanica a punto sia fisso, sia mobile.

Si conferma, quindi, che le uniche fonti energetiche rinnovabili accessibili per costi e livelli tecnologici richiesti sono costituite da: olii vegetali da utilizzare raffinati in motori Diesel; alcoli da utilizzare puri o in miscela con benzine nei motori Otto; olii grezzi, alcoli e biomasse ligno-cellulosiche da utilizzare in motori a combustione esterna o per la produzione di calore ai fini essiccativi.

Considerando lo stato attuale della tecnica, tuttavia, i diversi tipi di motori si pongono oggi come candidati per applicazioni diverse. In questo quadro risulta di primaria importanza valutare le potenzialità di mercato al fine di incoraggiare e orientare l'iniziativa industriale.

La possibilità di produrre olii esterificati da utilizzare negli ordinari motori a Ciclo Diesel può essere considerata come un fatto acquisito. Su tale vettore energetico, infatti, la ricerca è stata iniziata sin dal 1973. I risultati raggiunti hanno trovato già pratiche realizzazioni in Austria, Germania, Italia e USA, mentre la CEE ha costituito un gruppo di lavoro ad hoc che, nell'Aprile 1992, ha formulato una serie di specifiche sulle caratteristiche degli oli vegetali esterificati da utilizzare in motori diesel esistenti. Tali specifiche saranno prossimamente oggetto di una direttiva comunitaria.

I partecipanti, tuttavia, hanno unanimemente riconosciuto che il successo per l'utilizzazione futura del biodiesel è fortemente soggetto a condizioni esterne, problematiche ambientali incluse. Prima fra queste la reale possibilità che le colture oleaginose possano offrire condizioni di competitività economica e remuneratività per gli agricoltori. Ciò dipenderà dai prezzi internazionali del gasolio, dai prezzi delle materie prime agricole e dai prezzi dei sottoprodotti di raffinazione.

Stante la situazione attuale del mercato, inoltre, i partecipanti raccomandano che i Governi assumano decisioni atte ad offrire un significativo supporto economico all'attuazione dei vari programmi di sviluppo in chiave sia agricola, sia industriale. Infatti, il divario attuale fra prezzo del gasolio e prezzo dell'olio vegetale esterificato è - almeno in Europa -

dell'ordine di 1/3. Tuttavia, si riconosce che i progressi che si potranno conseguire col miglioramento genetico delle piante interessate e con l'aumento dell'efficienza degli impianti di trasformazione saranno in grado, nel prossimo futuro, di ridurre significativamente i costi attuali di produzione e trasformazione delle specie oleaginose.

2.3 - Come conclusione generale, infine, i partecipanti raccomandano:

- un accelerato sviluppo di programmi di ricerca atti a conseguire un consistente miglioramento produttivo di specie vegetali a destinazione energetica, con particolare riguardo alle oleaginose ed alle ligno-cellulosiche a rapido accrescimento;
- lo sviluppo di programmi di ricerca e sviluppo indirizzati al miglioramento nell'efficienza degli impianti di trasformazione e conversione di tali produzioni vegetali;
- la messa in essere di ricerche finalizzate all'analisi, a livello globale, di tutte le possibili opzioni tecnologiche atte a procedere al successivo sviluppo di:
 - motori a ciclo Otto di basso costo e semplificati alimentati con bio-alcol;
 - motori basati sul ciclo Diesel specificamente adatti all'impiego di oli vegetali grezzi;
 - motori a combustione esterna alimentabili con vari tipi di combustibile;
 - generatori elettrici alimentati da biomasse.

3. Trasferimento di tecnologie meccaniche in agricoltura

Il tema è stato affrontato prendendo in considerazione due casi specifici.

3.1 Il caso della Deutz in Algeria - Nel 1969, a Costantina, è stata siglata una joint-venture tra la KHD (Germania) e il Governo Algerino per la produzione di motori e trattori. Questo nell'ambito di un programma centralizzato di sviluppo per l'industria e le

produzioni agricole di quel paese. La produzione industriale e' iniziata nel 1974 e, a tutt'oggi, sono stati prodotti 100.000 trattori, con un contenuto locale dell'80%.

Le principali difficoltà incontrate in questi 18 anni sono state le seguenti:

- scarse capacità di pianificazione da parte del management intermedio locale;
- insufficiente manutenzione degli impianti;
- scarsa flessibilità nell'approvvigionamento delle componenti;
- mancanza locale di industrie di medie dimensioni fornitrici di prodotti di base.

In ogni caso, questa esperienza ha dato all'Algeria la possibilità di iniziare un programma di industrializzazione e di incrementare sostanzialmente il grado interno di addestramento educativo e professionale.

E' stato suggerito di collegare il futuro potenziale di questa attività alle sue capacità di: aumentare gli spazi di mercato nel terzo mondo; mantenere un favorevole rapporto tra costo del lavoro e accettabili livelli di carenze produttive; sviluppare il ruolo di fornitore di macchine di buona qualità anche nei con-fronti dei paesi industrializzati.

3.2 Il caso delle trebbiatrici in Egitto - La relazione ha descritto lo sviluppo e la commercializzazione di una trebbiatrice a duplice funzione che può essere usata per tutti i cereali coltivati nei PVS. Essa è atta a fornire, al contempo, alimenti umani e alimenti zootecnici recuperando le paglie trebbiate. Questo è un problema tipico di molti PVS in cui riso e frumento sono coltivati in rotazione e la paglia di quest'ultimo deve essere necessariamente reimpiegata come alimento zootecnico.

L'esperienza acquisita con l'introduzione di questa nuova tecnologia in Egitto porta a tre conclusioni principali:

- l'attenta definizione delle esigenze di agricoltori e costruttori è essenziale per

il dimensionamento di nuove tecnologie in forme adatte alle necessità di mercato;

- la diffusione di tecnologie appropriate nei PVS deve passare attraverso l'esecuzione di diffuse e ripetute prove di campo delle macchine, considerando diverse colture e forme di coltivazione;
- lo sviluppo delle macchine condotto in stretta collaborazione tra Istituti di ricerca e sperimentazione e Costruttori può favorire la loro rapida commercializzazione.

Sulla base della discussione e delle informazioni raccolte, i partecipanti sono pervenuti alle seguenti raccomandazioni:

- nello sviluppo di nuove unità produttive, ogni paese deve considerare tutte le risorse interne disponibili, dall'industria di base a quella fornitrice di componenti, dalle istituzioni educative a quelle di ricerca;
- i Governi devono favorire le associazioni tra i produttori al fine di permettere la definizione di migliori standard qualitativi in funzione delle richieste locali;
- nella scelta di costruttori associati con i centri di ricerca si deve tener conto dei seguenti criteri di base:
 - disponibilità ad accettare nuove idee e suggerimenti dall'esterno;
- volontà di fornire prodotti di qualità e di provvedere, stabilendosi il mercato, idonei servizi post-vendita;
- disponibilità a considerare la produzione di macchine agricole come attività primaria;
- volontà di stabilire un mercato basato sulla vendita diretta agli agricoltori, indipendentemente da sussidi governativi;
- disponibilità di risorse economiche sufficienti sino a che le macchine abbiano risolto tutti i loro problemi di campo e si siano affermate sul mercato;
- creazione di unità produttive locali di media dimensione aventi, tuttavia, la volontà di espandere le linee produttive;

- seria volontà di sviluppare un'attività a lungo termine senza mirare a profitti immediati.
- per quanto riguarda la commercializzazione, invece, vanno considerati i seguenti punti principali:
- mirare all'adattamento e al miglioramento delle macchine esistenti;
- coinvolgere i costruttori locali sin dalle fasi iniziali di sviluppo di un nuovo processo;
- far tesoro delle critiche di agricoltori e costruttori locali;
- adottare progetti che rispondano alle capacità produttive locali;
- incoraggiare i costruttori a procedere per serie produttive inizialmente limitate e atte a saggiare il mercato;
- favorire ampie azioni dimostrative di campo in tutta l'area di mercato prevista.

La iniziativa privata offre - rispetto a quella pubblica - un approccio più efficace allo sviluppo.

4. Imprese agromeccaniche di servizio: conseguenze sull'evoluzione delle macchine agricole. Una analisi preliminare

Su questo tema sono state presentate due relazioni di base relative: una, ai paesi industrializzati; l'altra, ai paesi in via di sviluppo.

4.1 - Circa i Paesi industrializzati, i partecipanti hanno anzitutto riconosciuto che in molti di essi si assiste, da un lato, a crescenti carenze di manodopera agricola e, dall'altro, a fenomeni di sovrameccanizzazione delle aziende, con conseguente riduzione delle ore di impiego di trattori e macchine e incremento dei costi di svolgimento delle operazioni.

Ciò giustifica lo sviluppo e il rafforzamento del ruolo delle imprese in conto terzi per le quali hanno esaminato - a titolo di esempio - la situazione in due Paesi europei (Italia e Spagna), rilevando la crescente importanza del fenomeno sviluppatosi spontaneamente e senza precise regolamentazioni.

Nel caso dell'Italia, si tratta, soprattutto, di imprese di piccole dimensioni, spesso a carattere familiare (potenza totale presente: meno di 200 kW), che tuttavia svolgono un'importante funzione coprendo buona parte dei lavori di campo di piccole, medie e grandi imprese agricole. Ciò, con particolare riguardo alla mietitrebbiatura dei cereali e allo svolgimento dei lavori di preparazione del letto di semina.

Ampie, peraltro, sono risultate le differenze di costo fra i vari Paesi. Nello Stato di New York (USA), a esempio, il costo dei servizi svolti da contoterzisti risulta pari a circa il 40% di quanto accade in nord Italia. Ciò appare collegato alle diverse situazioni delle strutture produttive e al grado di utilizzazione delle macchine che, in USA, dominano aree di raggi anche superiori a 50 km, contrariamente a quanto avviene, in media, nella Comunità Europea, ove raramente si raggiungono raggi d'azione di 10 km.

Sulla base di un'analisi di sensibilità sul dimensionamento tecnico ed economico della meccanizzazione, i partecipanti hanno riconosciuto il ruolo economico dell'impiego del contoterzismo indipendentemente dalla dimensione dell'azienda, là ove non vi sia manodopera sufficiente o, per converso, si debba ricorrere a salariati fissi.

Tale ruolo, tuttavia, potrebbe essere ancora maggiore ed essere svolto con risultati economici più positivi se venissero con chiarezza delineate le dimensioni ottimali delle imprese contoterzi. Tali dimensioni dovrebbero essere basate, probabilmente, su un carico di potenza installata di ordine non inferiore a 1000 kW.

I partecipanti hanno, infine, sottolineato l'esigenza che venga individuata e prodotta una meccanizzazione specificatamente indirizzata alle imprese agro-meccaniche in termini dimensionali e di prestazioni, onde poter conseguire ulteriori vantaggi.

4.2 - Circa i paesi in via di sviluppo, i partecipanti hanno riconosciuto che - stante la tendenza in atto verso una progressiva ridu-

zione delle forze di lavoro e le esigenze proprie dei periodi di punte di lavoro - l'utilizzazione di imprese agromeccaniche è destinata a giocare un ruolo crescente. Ciò in quanto:

- favorisce l'impiego di macchine moderne, atte a migliorare la qualità di svolgimento delle varie operazioni con conseguente aumento delle rese;
- evita investimenti di capitale che gli agricoltori difficilmente sono in grado di sostenere;
- riduce tendenzialmente i costi delle varie operazioni;
- provvede allo svolgimento delle varie pratiche con tempestività, quando la manodopera è una risorsa carente;
- favorisce il processo di modernizzazione dell'agricoltura.

In questo quadro, è stato considerato, come caso di studio, la Giordania ove circa il 50% degli agricoltori sono part-time con dimensioni aziendali assai modeste e già esistono diverse figure di contoterzisti (privati, pubblici e semi privati). E' stato valutato, in questo caso, che il costo di svolgimento delle varie operazioni mediante imprese agro-meccaniche è molto inferiore a quello che si avrebbe qualora le stesse operazioni venissero svolte direttamente dai singoli agricoltori. Ciò comporta, nel caso in esame, un'esigenza

complessiva di macchine e trattori diversa per tipologia e inferiore per numero.

4.3 - I partecipanti, in conclusione:

- riconoscono il ruolo fondamentale che le imprese agro-meccaniche di servizio sono in grado di svolgere nei paesi sia industrializzati, sia in via di sviluppo;
- raccomandano: da un lato, che si promuova in ogni paese una razionale organizzazione di contoterzisti privati dotati di macchine idonee; dall'altro, che i costruttori definiscano, in riferimento alle varie condizioni locali, le catene di macchine più appropriate (potenza, capacità di lavoro, architettura ecc.) si da mettere in grado i contoterzisti stessi di poter svolgere al meglio la loro attività.

Raccomandano, altresì, che i vari governi adottino politiche incentivanti la creazione di un razionale sistema di contoterzismo atto a servire al meglio le esigenze agricole, contribuendo così a ridare competitività e remuneratività economica alle varie agricolture e consentendo la riduzione della popolazione attiva nelle agricolture stesse.

Essendo, peraltro, il fenomeno non sufficientemente conosciuto, concordano sull'esigenza di approfondirlo in una prossima riunione sulla base di una serie di contributi specifici che verranno forniti da tutti i Paesi partecipanti.

OPENING SESSION

Prof Giuseppe PELLIZZI
President of the Club

Italy

Good morning Ladies and Gentlemen. I would like to give you some explanations. First of all, the official welcome to all of you to this Fourth Club of Bologna Meeting and welcome to the new Members who participate for the first time to this Meeting and deep thanks to the Key-note Speakers who have accepted to prepare the reports and give us the contribution of their own experience on the various subjects.

You can find some documentation in your folder. Among them, is the Proceedings of the Third Meeting, together with a sheet to fill in order to provide to the Secretariat the names and addresses of people of your Country that could be interested in receiving the Proceedings of this last meeting and of the previous ones. Would you kindly provide it during the Conference to the Secretariat or, if you prefer, would you kindly return the sheet to the Club Secretariat by the end of December. You will find also the last and final edition of the Country Reports. You remember that last year we have discussed on them we have produced a first edition. The various reports have been improved, completed, some new countries have been included and this is the last edition. Of course this edition concerns the situation in 1989, so it is a little bit different now, especially for the East European countries. We will discuss if it is possible to update it in the near future. In addition you will find a book published by the European Community Club of Advanced Engineering for Agriculture, on the possibilities offered by new mechanisation systems to reduce agricultural production costs. This is a report prepared by a group of Experts of the EC countries, on different subjects, and the Club of Advanced Engineering for Agriculture has decided to publish it because some analysis could be useful for the agricultural machinery development. You can find also the first copy of the first announcement of the 12th World CIGR Congress -

AgEng. 95 Conference. Please be so kind as to help us in having some participation from your Countries. Just to inform you, up to now we have received more than 120 pre-registration forms from the United States. It is the first time that a CIGR congress receives such a big participation from the United States.

You will find also the available key-note reports.

Last but not least, I should like to propose to you that we close our meeting of this morning at 12:30 so to have the possibility to visit the documentary Exhibition of the European Research, organized by EIMA and UNACOMA.

Let me inform you also that the following members have kindly accepted to act as Chairmen of the various Sessions: Dr. White (UK) for Session 1 of this afternoon on Energy and Agriculture; Dr. Rjik, Head of Agricultural and Engineering Services of FAO, for the Session 2 concerned with the Transfer of Technologies in Agriculture; Dr. Jongebreur, Director of the IMAG, Nether-lands, for the Session 3, concerning the Con-tractors for Agriculture.

Let me inform you also that at the end of each Session the preliminary Conclusions and Recommendations will be distributed so that you can read, discuss and alter them, in order to have the final approval at the end of the Meeting tomorrow afternoon. Please use all efforts within your Country to diffuse them, in your language, possibly in technical journals on agricultural machinery, in order to in-crease the weight of the Club and of the recommendations forward to the Governments and to the Manufacturers.

Ladies and Gentlemen, I am honoured to welcome the President of UNACOMA and to express on your behalf our deep thanks to UNACOMA for the hospitality. Mr. Celli, President of UNACOMA, you can take the floor, for your welcoming address, as usual.

**Mr. Alfredo CELLI President
of UNACOMA Italy**

Today is the fourth plenary assembly of the Full Members of the Club of Bologna, an assembly which coincides with the opening of EIMA and it is held for the 23rd time. It is with special enthusiasm that I welcome you personally and on behalf of all the machine manufacturers belonging to UNACOMA. Furthermore, I would like to thank you for having accepted once again our invitation. Our special thanks to Prof. Pellizzi and all the Members of the Board of Directors, who have enthusiastically dedicated themselves to laying the bases for the Club of Bologna, an organization which aims at functioning as an observatory and as a meeting point at research and supply level, in the field of mechanical systems for agriculture throughout the world.

For the Italian manufacturers who are promoting EIMA this occasion is not only a source of pride but also a form of acknowledgement of the role of the Bolognese show in stimulating the scientific and cultural debate with respect to mechanization strategies.

These last few years have been full of uncertainties. Not a single sector of our economic or social life has been left untouched. As far as we are concerned what we need today, more than ever before, are precise indications regarding the road that European and worldwide agriculture will follow in the years which separate us from the year 2000.

What we need are reliable evaluations, if absolute certainties are not forthcoming, which are ready to support the industry of agricultural machinery manufacturers and which will provide us with the information on what should be done for agriculture in other countries.

In the next few months, perhaps even in the next few weeks, precise answers should emerge. The hopes that a breakthrough in the GATT negotiations will lead to the same positive conclusions as the Uruguay Round have a firmer foundation now, with the renewal of

the United States' Administration. A renewed, vigorous world trade agreement could only have positive effects on agriculture, contributing to the definition of more specific production scenarios, with positive reflections on all aspects of agricultural machinery.

On the other hand, the international panorama has evidenced profound changes which must be governed, at the risk of the complete deterioration of both man and environment. In fact, the world population today is estimated at 5 billion people and this figure is expected to double by 2030.

If we limit our concerns to the domestic market, i.e. the European Community, we should point out that the EC subsidizes agriculture with something like 33 billion lire in ECU. But according to the reform in agricultural community policies, subsidies are scheduled to drop by 30% by 1996. It is thus easy to understand why faith in the future is lacking and why farmers are certainly not keen on buying new machinery.

In this perspective, which involves the increasing influence of market mechanisms, it will surely become increasingly difficult to encourage design and construction of machines which meet current demands, i.e. reliable, high-quality machines with sophisticated ergonomic features, which make ample use of computerized and electronic systems for the continuous control of working conditions. These machines cost much more with respect to ten years ago and the replacement of obsolete machinery with technological system is taking place at a much slower rhythm in the more advanced countries than could have been imagined.

What we see over the horizon is a new painful fracture which will affect not only production ratios, the choice of the type of cultivation and the entrepreneurial profitability, but in an increasingly dramatic way the very relationship between man and environment. The images of the past few days, of the floods in Tuscany, of other cities dear to the spirit of every European, threatened by swollen rivers, are quite a vivid warning. Breaking the man-environment

chain, in which agriculture is the vital link, is a momentous act for which we will have to pay the consequences sooner or later.

But, if the equation man-environment-agriculture is a true one, the man-machine-agriculture relationship is indispensable. The Club of Bologna was in fact founded to reinforce and enhance these values, these ideas, these production capacities. I believe that your collaboration today and tomorrow will enrich our experience and make us increasingly aware of our responsibilities.

Thank you very much for your attention and I hope you have a present stay, and good work.

G. PELLIZZI

Thank you very much, President Celli. I am pleased now to announce, you, just to give you an idea of what the Club of Bologna means, that Prof. Kitani has translated into Japanese the Proceedings of the Club of Bologna of the last year. I think that Prof. Kitani would like

to give you one copy so that you can read it tonight, in Japanese.

Thank you very much, Mr. President, and once more thanks to UNACOMA for the hospitality. As you may have heard, UNACOMA pays a special attention to our work and believes that what we will discuss and the recommendations we will prepare for the different subjects will be very useful for the development of agricultural machinery and mechanization all around the world.

We can now start with the first special lecture, on a very important and current subject: the GATT and agriculture. As was mentioned by Mr. Celli, this topic is a very important problem and also the Italian newspapers of today report that a new effort for the activation of GATT will be made in the near future, after the new leadership in the United States. I am pleased to inform you that we have two very important key-note Speakers: Dr. Sharples, from the United States Department of Agriculture, Economic Research Services, and Dr. Sardi de Letto, Director-General of the Ministry of Foreign Trade of Italy. I should like to start with the key-note speech of Dr. Sardi de Letto, then we will continue with the speech by Dr. Sharples and finally we will open the discussion.

SPECIAL LECTURE

**GATT and Agriculture: Consequences
for Mechanisation and Related Industries**

Dr. Giovanni SARDI DE LETTO
Ministry of Foreign Trade

Italy

**GATT AND AGRICULTURE:
CONSEQUENCES FOR
MECHANISATION AND RELATED
INDUSTRIES**

Over the past six years, practically every day we have been informed about the developments of the Uruguay Round negotiations which started in Punta del Este in 1986. During this period several meetings took place, and while we are speaking the last one has just finished: it is well known that Ray Mac-Sharry, the EC Commissioner for Agriculture, and Ed Madigan, the USA Minister for Agriculture, ended their last meeting in Chicago no longer than ten hours ago and they went very near to an agreement.

Although a political deal has not been completely reached at bilateral level, the main problems have been settled.

It is necessary to understand now how the present as well as the new USA administration will carry on the agricultural matter and the whole negotiation, without forgetting that the Uruguay Round has to take place in Geneva, where all Contracting Parties have to give their agreement, and this is not evident.

I think that at present a lot of progress has been made and that it could be a good base for the conclusion of the negotiation.

For the first time since the GATT exists, a serious negotiation is taking place concerning agriculture, although it is not an easy subject to be dealt, and a lot of difficulties remain unresolved.

The first difficulty comes from the different opinions which exist on this matter. In some countries it is considered just one of the economic sectors, while in Europe agriculture is considered as a sector of great importance: politically, socially, culturally, environmentally, as well as from a strategic point of view

(self-sufficiency, etc.). For this reason when in 1962 the Common Agricultural Policy was agreed, one of the main objectives of the EC was to obtain self-sufficiency in food production, secure supplies as well as a fair standard of living for farmers, stabilized markets and reasonable prices for consumers.

Although, I am not an agricultural expert, my experience is basically on trade issues, I think I can state without any doubt that agriculture is not protected only in the EC, but in several countries in the world, such as the USA, Japan, South Korea, EFTA countries, etc. As a consequence, this makes it more difficult to reach a compromise among Contracting Parties of the GATT.

However, after 30 years many changes have occurred in the world and, for instance, while at that time 20 million cows produced 57 Mt of milk a year, today 10 million cows produce 69 Mt.

The Common Agriculture Policy has succeeded in ensuring sufficient food supplies, and going even further, to the point that the Community has now a surplus of several products.

Conscious of this problem and aiming to stabilize world markets, in the interest also of other producing and exporting countries in the world, the EC has been trying to reform the mechanisms of the Common Agriculture Policy: on the one hand keeping its principles concerning market unity, Community preference and financial solidarity and on the other hand to open the Community, in the long term, to competitive price policy. This has to be considered as the beginning of a process and not the ending point.

The second difficulty arises from the confrontation of two different positions: the American one which is aimed at obtaining all concessions over a short period, and the European one which is based on graduality. The collision between the two positions has carried the Round to the point of collapse, pre-venting any agreement being reached.

I believe the time has arrived to overcome this obstacle

Over the last three years the world has known a faltering growth: the value of trade rose by scarcely 1.5%. A successful conclusion of the Uruguay Round is necessary to boost trade, otherwise recession will continue and recovery delayed.

Agricultural reforms made by the Community tend to favour the opening of its market; they are on the right direction and should be considered in a positive way. Although there are still differences between the USA and the EC positions, a path has been carved out, and the acceptance of the tariffication of agricultural barriers by the Community is a great step forward.

Tariffs will mean transparency for agricultural trade and the base for future tariff reductions: the industrial sector, in a certain way, has had the same positive development.

Furthermore, the availability by the Community to reduce its domestic support and its export refunds must not be rejected as insufficient. In Europe, governments are not ready to cut these aids drastically.

As I said before, for several reasons, this process will require time and consequently it has to be considered on a long term basis.

Mistakes made in the past in agricultural negotiations must be avoided: all Contracting Parties of the GATT should be aware of the importance of this moment and not to miss it, otherwise multilateralism risks to fail and bilateralism will take over.

On the contrary, if problems are understood and retained for consideration by Contracting Parties, I think there will be room for a compromise. I have the feeling that some countries have already made such a move and this has happened even among the CAIRNS' Group: New Zealand, for instance, although in a position to request concessions to other countries, in reality seems to be very conscious of the need for gradual liberalizations.

However, the Uruguay Round does not concern only trade in agriculture, it also covers

services and textiles, international respect for patents and copyrights, improvement of mechanisms for settling trade disputes, etc.

Where agreed, the whole package of the Uruguay Round could immediately have an impact on trade and to increase the global income, which according to a study made by "The Economist" would be about US\$ 120 billion a year. In such a case America's share would be roughly US\$ 35 billion a year, while Japan would get US\$ 28 billion and the EC more or less the same share.

According to another study, carried out by the American Enterprise Institute, the benefits for world economy would be US\$ 5,000 billion over the next ten years.

In any case, I think that nobody can deny the advantages that would come from an agreement on trade, which unfortunately until now continues to be blocked.

However, greater freedom in trade would create some negative effects, such as the reduction of employment in some sectors, but this would be compensated by an increase of employment in other sectors. Such a process will force economies to change, producing a veritable turmoil in the labour market. Thus, it is foreseeable that a compromise in the Uruguay Round may reduce farm employment, and would increase jobs in services, construction, high technology and other manufacturing sectors.

As far as agriculture will be primarily concerned by a successful conclusion of the Uruguay Round, an increase in the size of farms and the modification of some flows in agriculture are expected, as well as a reduction of production in some countries, especially Europe, and an increase of exports from other important agricultural producing countries like USA, Argentina, Australia, etc.

Then, as a consequence of the opening up of agricultural markets, some countries will be forced to abandon certain productions and to rationalize the cultivation of other products in order to be more competitive.

All this will certainly have an effect, on the one hand, on the use of more sophisticated machinery, and on the other hand, on an increase in the demand of machinery from agricultural countries which will have a growth in their production.

Italy will be faced with all these changes, although agriculture contributes only roughly 4% of the GNP.

More precisely, Italy is not self-sufficient in several agricultural products. On the basis of 1991 data it imports in this sector US\$ 12,3 billion (7.1% of total imports) and exports US\$ 4.6 billion (2.9% of total exports). Furthermore, food stuffs are imported for US\$ 13.9 billion (8% of total imports) and exported for US\$ 7 billion (4.3% of total exports). On the contrary Italy is an important producer of agricultural machinery and in 1991 these exports amounted to roughly US\$ 1.3 billion (1,631 billion lire), while imports were only US\$ 0.3 billion.

Among machinery exports, tractors represent roughly 55% of the total in this sector. Italy exports mainly medium power tractors to Europe and the USA.

On the basis of my experience on international trade, I believe that possible tariff reductions, which could take place in the Uruguay Round, will increase competitiveness in this sector. Consequently if Italian machinery producers would like to maintain their world market share, and possibly to increase it, they should make investments, in order to reduce the costs of products and to improve their quality.

Furthermore, the actual structure of the Italian machinery sector, consisting of several producers, could be a disadvantage. For this reason I think that new forms of cooperation should be introduced and developed: this sector too, as well as others, in the future should be able to internationalize itself. This will help to reinforce its presence in other world markets, such as Latin American countries, China, etc.

Considering the current reforms of the Common Agricultural Policy and the follow-up of the Uruguay Round, Italy could expect the following consequences:

- to decrease its expenditure for agricultural imports;
- to undergo a further depression of its agricultural production which are not sufficiently competitive;
- to export more machinery, if this sector will be able to adapt rapidly its production to the European standards and to the new demand which will come about after the Uruguay Round.

Expressing my point of view, I avoided to make any comment on the proposals made by Mr. Dunkel, the Director-General of the GATT, because I do not wish to interfere in the difficult work carried out by negotiators.

However, I would like to draw your attention to the fact that the negotiations in agriculture should be evaluated, taking into account that it is the first time that this sector has been carefully negotiated.

In previous multilateral negotiations a deal has been sought on this matter, but a positive result was never reached.

There was always two opposite positions:

- one wanted the full extension of the free trade rules of the GATT to agriculture, in other words the elimination of trade barriers over a short period;
- the other wanted the liberalization of trade in agriculture step by step.

This time, the possibilities of a successful conclusion of the Uruguay Round are more concrete than in the past, and this may become a reality only if all Contracting Parties will be pragmatic.

We should remember that in the industrial sector over 45 years have been necessary to reach important progress for the elimination or reduction of tariffs, quantitative restrictions and other trade barriers.

Nevertheless there are still industrial products which are protected in different ways.

In conclusion, I wish to say that the Uruguay Round may be a success in the agricultural sector if all Contracting Parties will be able to accept that the liberalization of this market

will be achieved progressively. I am convinced that we should start the process of agricultural liberalization in without any delay if we wish to reduce the enormous differences existing in terms of opening up of the markets between the agricultural and the industrial sectors.

Table I - Export situation for tractors in 1991

ENGINE POWER (kW)	TOTAL (%)		EFTA AND EC SCANDINAVIAN COUNTRIES		AUSTRALIA (10 ⁹ Lit)	JAPAN (10 ⁹ Lit)	TAIWAN (10 ⁹ Lit)	USA AND CANADA (10 ⁹ Lit)
	(10 ⁹ Lit)	(10 ⁹ Lit)	(10 ⁹ Lit)	(10 ⁹ Lit)				
25+37	59.4	7.1	26.2	10.2	1.0	0.04	0.3	2.6
38+59	294.2	35.4	137.5	16.6	3.3	6.7	3.8	16.4
60+75	305.8	36.7	210.6	15.5	1.4	2.6	2.8	15.5
76+90	76.3	9.1	57.6	7.3	1.1	1.2	0.4	5.0
Total tractors	831.1	100.0						

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(The views presented here are those of the authors and do not represent official positions of the US Department of Agriculture)

A GATT AGREEMENT, POLICY REFORM AND THE GLOBAL FARM MACHINERY INDUSTRY

1. Introduction

My joint author and I approached this topic with some concern. I had to have this paper written by early September, knowing that it would not be presented until early November...the day after US elections! Events between September and now could greatly alter the outcome of GATT negotiations. I thought about writing several papers, each

focusing on a different possible GATT outcome. Then I could wait until today to choose which to present. After worrying about this problem awhile, I came to realize that GATT reform was only one chapter in the contemporary story of political reform taking place that could reshape world agriculture. Consequently, we discuss GATT in this paper, but we also focus on the more basic forces of policy reform that we see taking place around the world.

We are not experts on the world agricultural machinery industry. We have performed no sophisticated analyses of trade in farm machinery. But we have expertise on world agricultural trade and how barriers to trade distort trade. In this paper we use our knowledge of agricultural trade to come to some general conclusions that we hope are useful to you.

Conclusions in this paper rest upon the following premises:

- world agriculture is now, and has been for a long time, highly distorted by the domestic policies of many countries. In general, this "distortion" takes the form

of distorted incentives to producers and consumers to produce and consume quantities of goods that differ from what would be produced or consumed under more open world agricultural markets;

- in recent years forces have been building for many countries to consider reforming agriculture and other industries. The forces include large national debts, slow economic growth, environmental degradation, and the high cost of supporting the agricultural sector. A significant reduction in these policy distortions would have a major long run impact on the world's crop production and associated demand for machinery;
- these forces have led many countries to support the current round of GATT negotiations which include agriculture for the first time. A central part of those negotiations is to reduce domestic policy distortions to agriculture as well as to reduce border protection;
- these forces have also led many countries to start serious reform of their domestic and trade policies, irrespective of what happens in the GATT negotiations. Economists call this internal reform, "structural reform" or "domestic policy reform." Given the structural reform that is currently taking place around the world, and given the rather modest goals expected to be obtained in a GATT agreement for agriculture, we conclude from the economic evidence that a GATT agreement will not cause much additional change in the world's agriculture - especially cereals and oilseeds - beyond what is expected to happen any-way in response to domestic reforms that are taking place. But this does not diminish the importance of a GATT agreement in institutionalizing the reforms that are taking place in many countries.

Since the current round of GATT negotiations was launched in 1986, the world has changed dramatically. The intervening years have seen a US-Canada free trade agreement, significant EC CAP reform under the EC 1992 initiative, the demise of central planning in many countries, major macroeconomic problems world-

wide, dramatic changes in interest rates and exchange rates, large numbers of corporate mergers directly affecting the international business climate and the machinery industry, and most recently the North American Free Trade Agreement. The important point to take from all these events today is that they all occurred within a span of the last 7 years, whereas any GATT agreement now comes with a proposed implementation span of the next 10 years. You'll appreciate our caution then, in broadening our remarks to look at basic economic principles that should prove enlightening regardless of the path of future events.

2. GATT plus agricultural policy reform: links to the machinery industry

In this paper we discuss two of the most important economic linkages between policy reform and the world farm machinery industry (**Figure 1**). One is the direct effect of a GATT agreement on the global supply of machinery. By lowering barriers to trade of machinery, we would expect an agreement to cause a gradual shift of production of machinery and parts to least-cost locations in the world.

The second linkage affects the demand for machinery. A GATT agreement, along with agricultural policy reforms that are taking place in many countries, could cause shifts in where crops are produced. They could also have a significant impact on farm structure in some countries. These changes would reshape the demand for farm machinery around the world.

There are other linkages that are not discussed here. For example, a GATT agreement or domestic restructuring could change fuel costs to farmers. A significant change in fuel costs would have a direct impact on the demand for various kinds of farm machinery.

2. A possible GATT agreement

Lets speculate about what might be the nature of a GATT agreement. At the time these

comments were drafted, the most likely agreement for agriculture appeared to be something similar to the compromise "Dunkel Proposal," authored by Arthur Dunkel, the GATT Director-General. For those of you who have not kept up with the GATT negotiations for agriculture, let me briefly review its four main points:

- all nontariff import barriers (for example, import quotas, licenses) import barriers are converted to tariffs and reduced by 36%, on average, across agriculture;
- government expenditures on export subsidies are to be reduced 36%, and the volume of exports subsidized is to be reduced 24%;
- government direct support to agriculture is to be reduced 20%;
- a minimum of 5% of a country's agricultural consumption is to consist of imports.

The above levels are to be reached in ten years after the agreement begins. The base period from which the percentage reductions are figured is a 1986-88 average.

Key points to note are that protection was very high in the EC, Japan, and the United States during the base period of 1986-88, and all three have since put in place some policy reform. Economic analysis indicates that a Dunkel-type of agreement would not have much of an impact on production of major grain or oilseed crops in any of these countries over the 10-year period. The policy reforms already underway would tend to equal or exceed the GATT agreement. Thus, this form of GATT agreement would have little additional impact on the demand for farm machinery.

A GATT agreement also would likely reduce barriers to trade of farm machinery. However, this would not be known until after a GATT agreement was signed and countries had made adjustments to conform with the agreement. Tariffs are significant barriers to trade with some countries but not with others. For example, Mexico had an average tariff of 16 percent on tractor imports in 1989, but the

United States and Japan had an average tariff of about 1% (Figure 2). Reductions of tariffs and other trade barriers (such as special safety codes, nonstandard technical requirements, red tape at the border, etc.) would improve access to machinery markets in Mexico and other high-protection countries.

4. Impacts on the world machinery industry: individual country cases

World trade in farm machinery grew rapidly during the 1970s but dropped off sharply in the early 1980s (Figure 3). The debt crises in developing countries and the farm financial difficulties in the United States were major causes of the decline. By the end of the decade, world trade had just recovered to the level of 1980. Our interpretation of projections indicate that the world machinery industry will not be experiencing the kind of growth in the 1990s and beyond that it experienced in the 1970s. But some significant adjustments in the industry will be made as a result of a possible GATT agreement and policy reforms that are taking place. Many of the possible adjustments imply increased machinery trade.

The major producing and exporting countries are the United States, Japan, France, Germany, Italy and United Kingdom. We examine these countries plus several potential growth markets. To do this, we examine how policy reforms would likely affect key economic variables that shape the machinery industry in those countries. Five of the most important economic variables are discussed here:

- farm income. If farm income falls, the demand for farm machinery is expected to fall;
- crop production patterns. A shift in crop production patterns and a change in overall output would have a direct impact upon the demand for machinery;
- restructuring of farming. If large (state) farms are divided into smaller (private) units, machinery needs will change. Likewise, if restructuring means

consolidation of small fields or farms into bigger ones, different machinery will be needed;

- subsidies on machinery investment. Many countries, especially developing countries, provide subsidized credit for farmers to purchase machinery and other inputs. If reform leads to removal of these subsidies, the demand for machinery will fall.
- machinery trade barriers. If a GATT agreement or policy reform leads to reductions in trade barriers, then the domestic machinery industry could be subject to more competition from imports. On the other hand, exporting firms would have more opportunities.

4.1 European Community

Countries of the European Community are active traders in farm machinery (**Figure 4**). Except for declines in the early 1980s, both exports and imports have shown long term growth. The machinery industry in the EC tends to specialize in medium sized farm equipment.

The EC farm machinery industry is highly competitive. The EC is a major world supplier of farm machinery, accounting for nearly half of world exports in recent years. Germany exports more than half of its machinery output, and Italy more than 40%. A small number of multinational firms are the primary producers of tractors and some larger machinery. Small and medium-sized firms produce most other machinery.

Demand for farm machinery within the EC has dropped steadily throughout the 1980's. The types of machines demanded have also changed. A tendency now exists for farmers to purchase larger, more powerful machinery. The agricultural machinery industry is also becoming more specialized, as evidenced by the large amounts of both imports and exports.

Nontariff barriers to intra-EC trade in agricultural machinery exist in several forms. Unique national vehicle equipment specifications

have required manufacturers to duplicate production and testing to meet existing national standards. Differing taxation levels and policies for refunding value-added taxes distort relative prices, as do national subsidies that support domestic firms.

The EC Commission is pursuing a program to harmonize member-country codes and standards. These directives call for EC minimum safety standards for tractors and for EC specification standards that would replace or add to existing national codes. The directives will have only minor effects on the industry in the short term, but in the longer term, with a common set of technical regulations, firms will probably streamline distribution systems and cut down on the number of tractor and machinery models.

For the European Community, current reforms and a GATT agreement imply changes relative to what would happen otherwise. As a result of these reforms, economists expect:

- lower farm income due to reduced price guarantees;
- a levelling off from the historic long run upward trend in crop production;
- gradual increase in farm size;
- somewhat lower machinery tariffs and reduced non-tariff barriers.

These changes imply that GATT reform and/or policy reform will lead to a reduction in overall demand for farm machinery, relative to what would have been had reform not taken place. And also, a gradual shift would take place to machinery better suited to larger farms. Domestic manufacturers would face stiffer competition from imports from other EC countries and from abroad as barriers to trade were removed.

4.2 United States

Through the latter half of the 1960s and during the 1970s, US farmers expanded their investment in farm machinery (**Figure 5**). Since then, total machinery investment has rapidly declined. Likewise, machinery exports

increased before 1980, and declined since then (**Figure 6**). During the latter 1980s, farm machinery imports have about equaled exports. The US tends to export large machinery and import small and medium sized equipment. These trends are indirect evidence of the contraction and specialization that have taken place in the US farm machinery industry.

The future of the farm machinery industry in the United States likely lies between the extremes of the expansion of the 1970s and the contraction of the 1980s. Current reforms in agricultural policy and a GATT agreement likely will have less impact on the demand for farm machinery in the US than in the EC. We expect any policy reform and GATT agreement to lead to the following impacts on future trends in US agriculture:

- little change in aggregate farm income from crop production;
- little change in the production level and mix of grains and oilseeds;
- a continuing trend toward larger farm units;
- little change in border protection. The domestic machinery industry receives very little border protection, so there would be virtually no tariffs to reduce.

These impacts on the machinery industry are expected to be quite small. They indicate little cause for change from expected future trends in the US machinery industry.

Similar conclusions could be made for Australia and Canada.

4.3 Japan

While Japan accounts for less than 10 percent of world exports of all farm machinery, they are still responsible for the production and sale of a significant portion of the world's tractors, particularly of the lower horsepower variety. During the 1970s and most of the 1980s, Japan's exports of farm machinery expanded. On the other hand, they imported relatively small amounts of machinery (**Figure 7**).

Current reforms in Japan and a GATT agreement imply:

- lower aggregate farm income; significant increase in field size, especially for rice production;
- farm consolidation - fewer and larger farms;
- possible reduction in protection of the domestic machinery industry.

Japanese farmers have heavily invested in small-scale farm machinery as a result of their high incomes, high labor costs, and small field size. The Japanese machinery industry has responded by specializing in building small-scale equipment for the home and export market. Reforms that are under way and are on the horizon imply significant changes for their machinery industry. Overall, total machinery investment in rice production could taper off due to lower farm incomes. There will be less demand for small-scale equipment and increased demand for medium-scale. The domestic machinery industry will have to adjust to produce medium-scale equipment while likely facing increased competition from imports. Similar observations can be made for rice production in Korea and Taiwan.

It is not clear where the medium-sized farm machinery would be produced; in Japan in retooled plants, in neighboring Asian countries, or possibly in Europe.

4.4 Other machinery importing countries

Dramatic changes are taking place in Eastern Europe and the Former Soviet Union. The restructuring of agriculture that is taking place is not GATT-related. But a GATT agreement could help keep the pressure on the governments to not put new forms of protection in place to protect domestic industries such as agriculture and the farm machinery industry.

The most obvious reform taking place in many of these countries is the formation of thousands of new private farms from the old state and cooperative farms. Medium-sized

machinery likely will be demanded by the new farmers, to replace the depreciated large machinery. Machinery demand will also be heavily influenced by the price of fuel and the access to credit. A big question is to what extent domestic manufacturing facilities can be used to produce farm machinery that effectively compete with imports or that compete on the export market. Since conditions in many of these countries are still quite fluid, it is difficult to say much more.

Finally, one needs to examine the developing countries on a case-by-case basis. They were a source of growth in world trade in the 1970s, but their demand for imports tapered off in the 1980s (**Figure 8**). In the past they were a minor source of machinery exports.

Dramatic policy restructuring is taking place in some developing countries especially in Latin America. Some of these countries also are starting to get their debt problems under control. Their reforms, augmented with a GATT agreement, could lead to a significant expansion of their commercial agricultural export sectors. These changes, along with reduced tariff and non-tariff barriers to machinery imports, likely would lead to an increase in demand for imported farm machinery. Keep an eye on them as possible growth markets.

5-Summing up

Many forces will affect the world farm machinery industry over the next ten years. Technology is changing, tillage systems are changing to meet environmental and conservation needs, we could see major changes in interest rates and exchange rates, and so on. In this paper, however, we ignore these important forces and concentrate on evaluating implications of farm policy reform and a possible GATT agreement.

Though there are many exceptions, the bulk of the forces for agricultural policy reform in today's world seem to be pushing for more open world markets. A GATT agreement would assist in reducing protection and facilitating trade. This means that comparative

advantage will play a larger role in determining where crops will be grown and where farm machinery will be produced. Government price support and trade policies will play a lesser role. Least-cost production and marketing will play greater roles in determining who produces what. As a consequence, trade in agricultural commodities and farm machinery should increase - relative to the prospects had there been no policy reforms.

Will a GATT agreement and policy reform lead to increased overall demand for farm machinery? Probably not in the next several years. Most studies indicate that these reforms would not cause world crop production to increase relative to what would occur without the reforms and could possibly cause a slight decrease. But the restructured economies of some of the developing countries could be growth markets for farm machinery.

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Figure 1 - Links between GATT Agreement and the global farm machinery industry

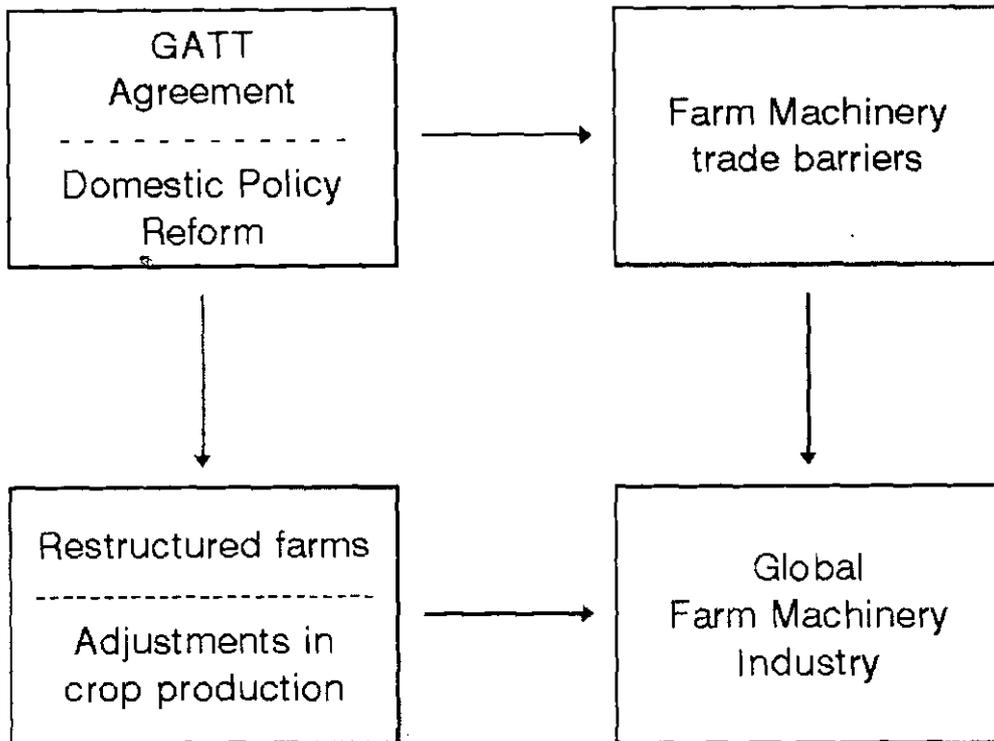


Figure 2 - Wheeled tractor import tariff (1989 average) (Source: UNCTAD TRAINS database)

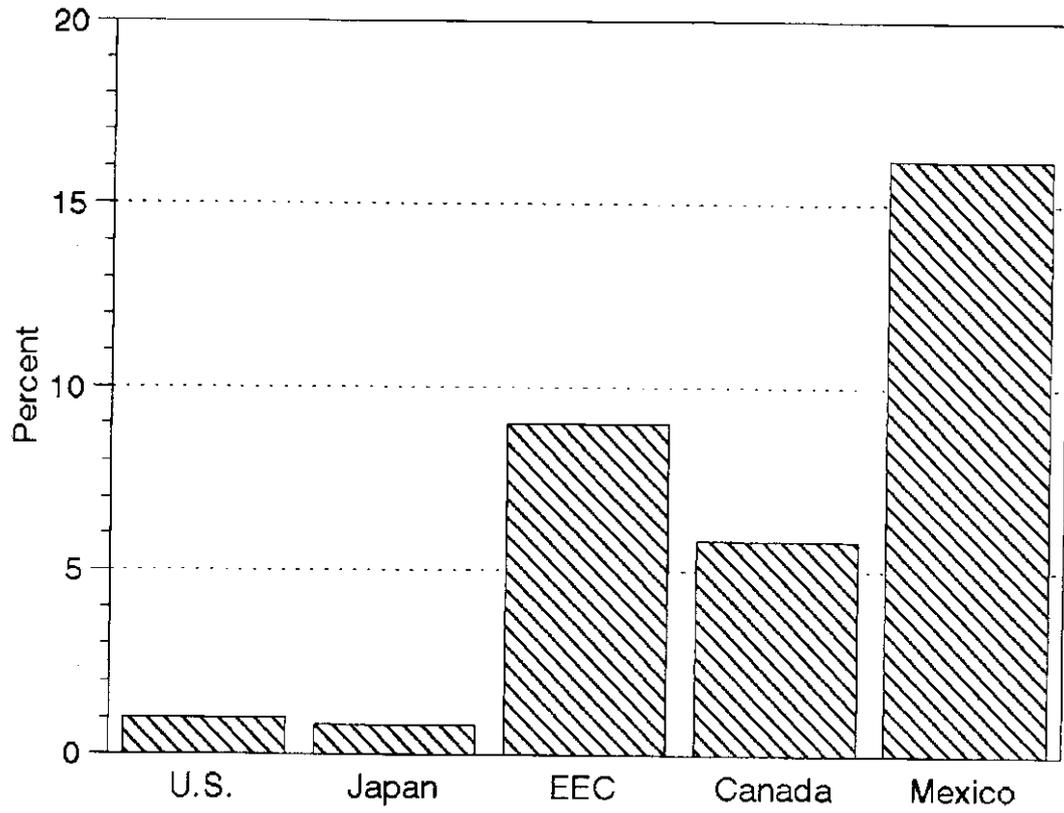


Figure 3 - Farm machinery exports (Source: FAO AGROSTAT database)

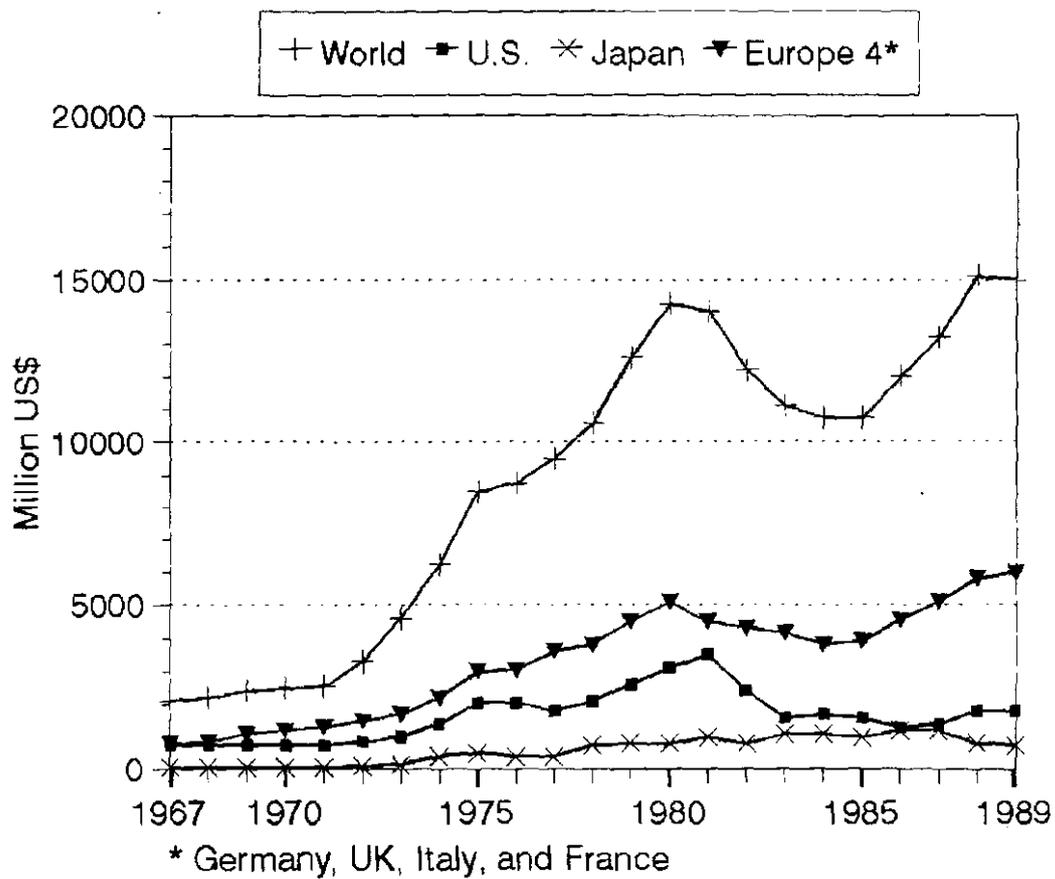


Figure 4 - Farm machinery trade European Community (Source: FAO AGROSTAT database)

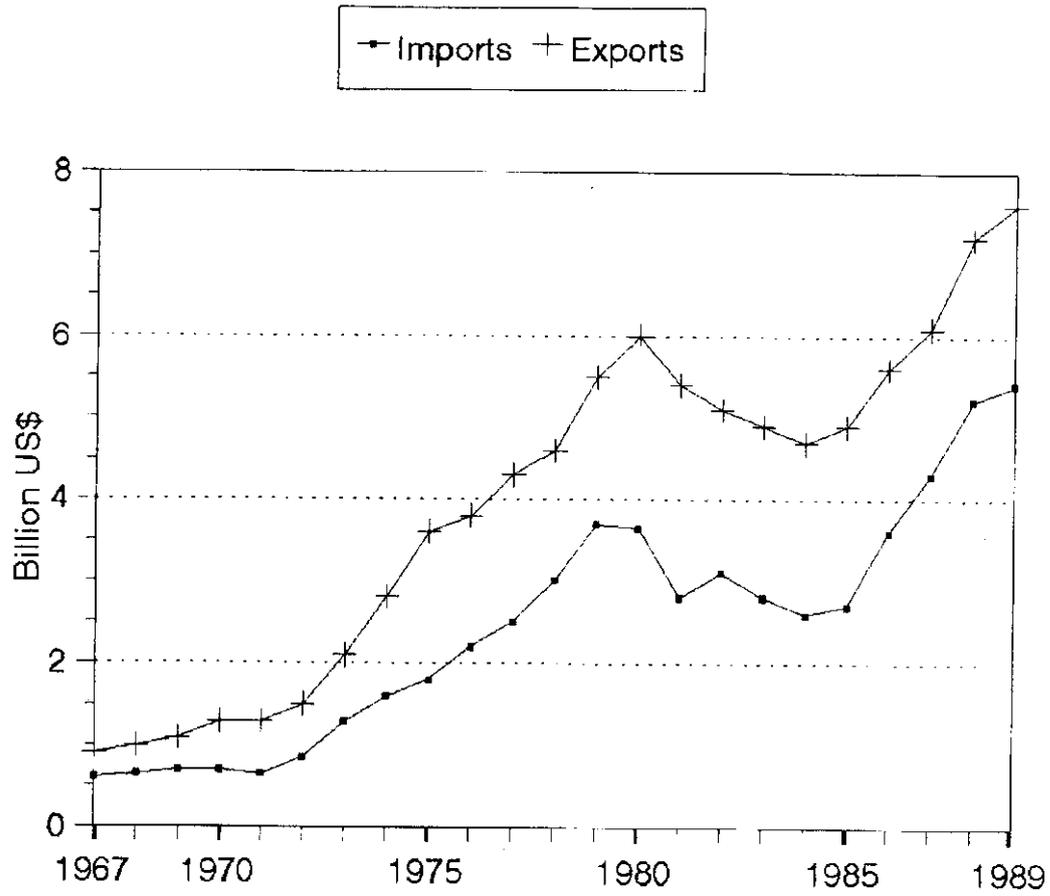


Figure 5 - Index of mechanical power and machinery in United States (Source: Economic Indicators of the Farm Sector, 1990)

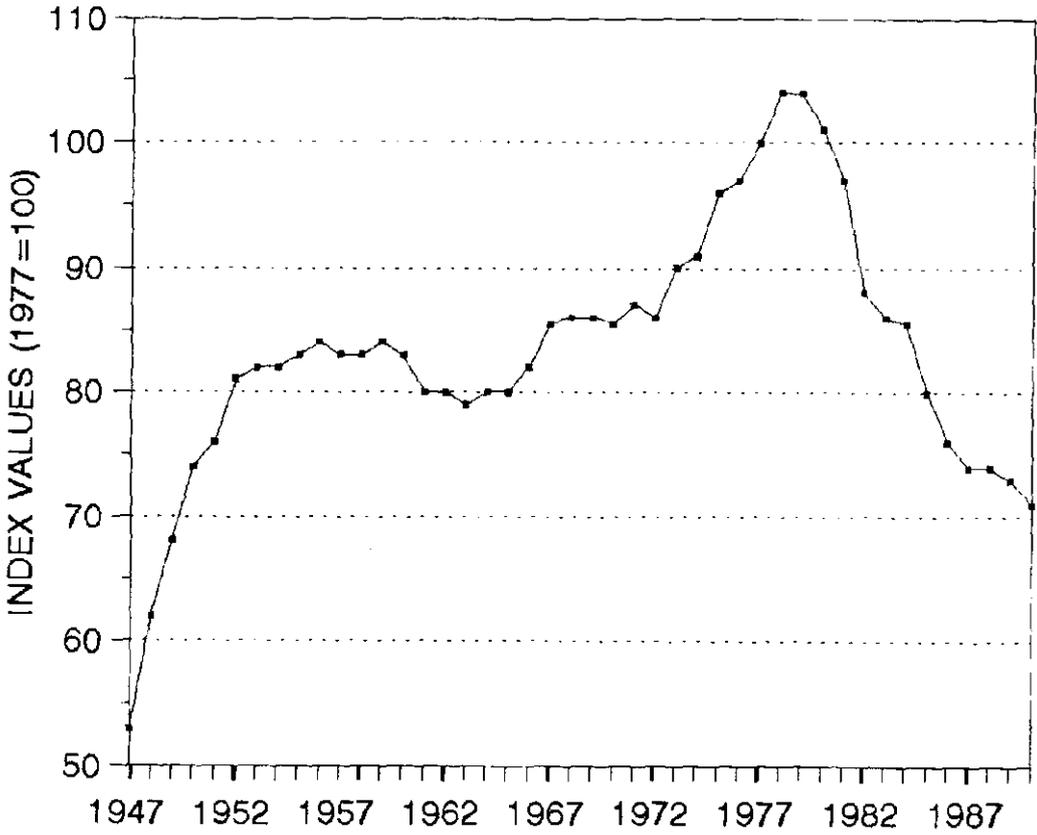


Figure 6 - Farm machinery trade in United States (Source: FAO AGROSTAT database)

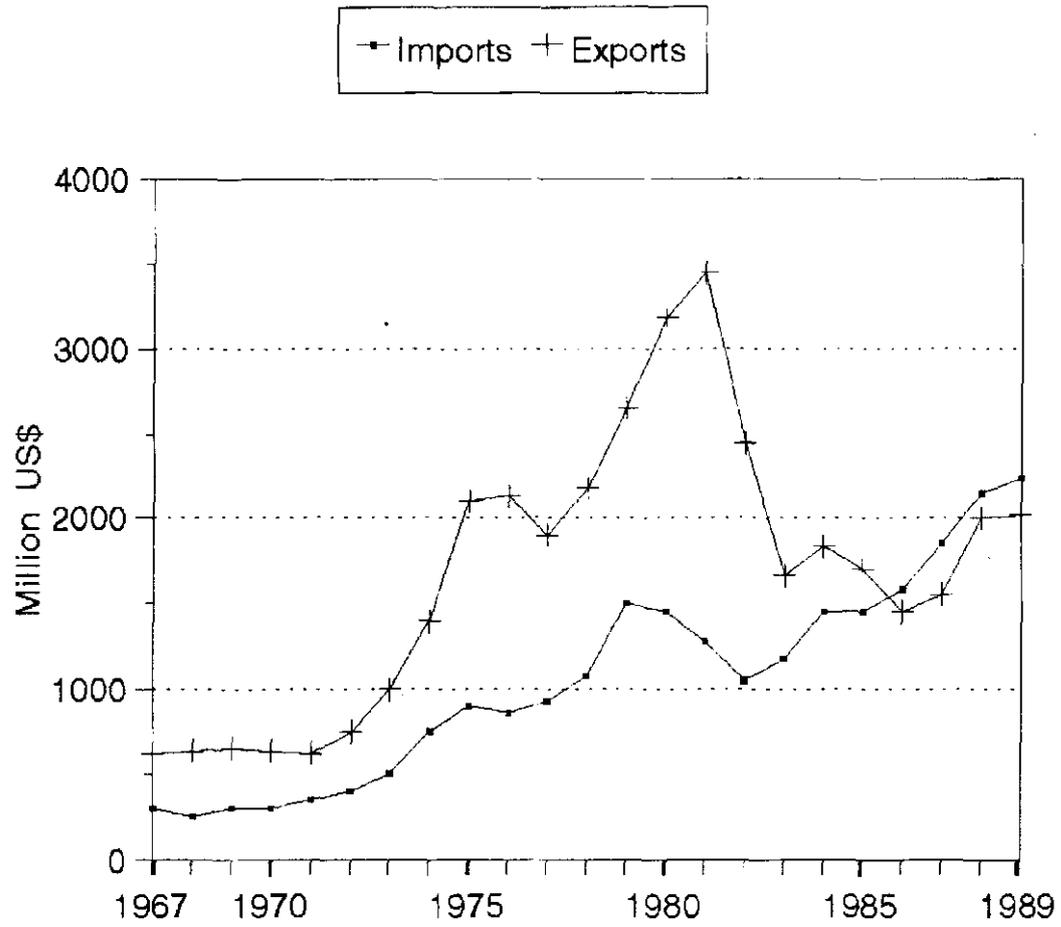


Figure 7 - Farm machinery trade in Japan (Source: FAO AGROSTAT database)

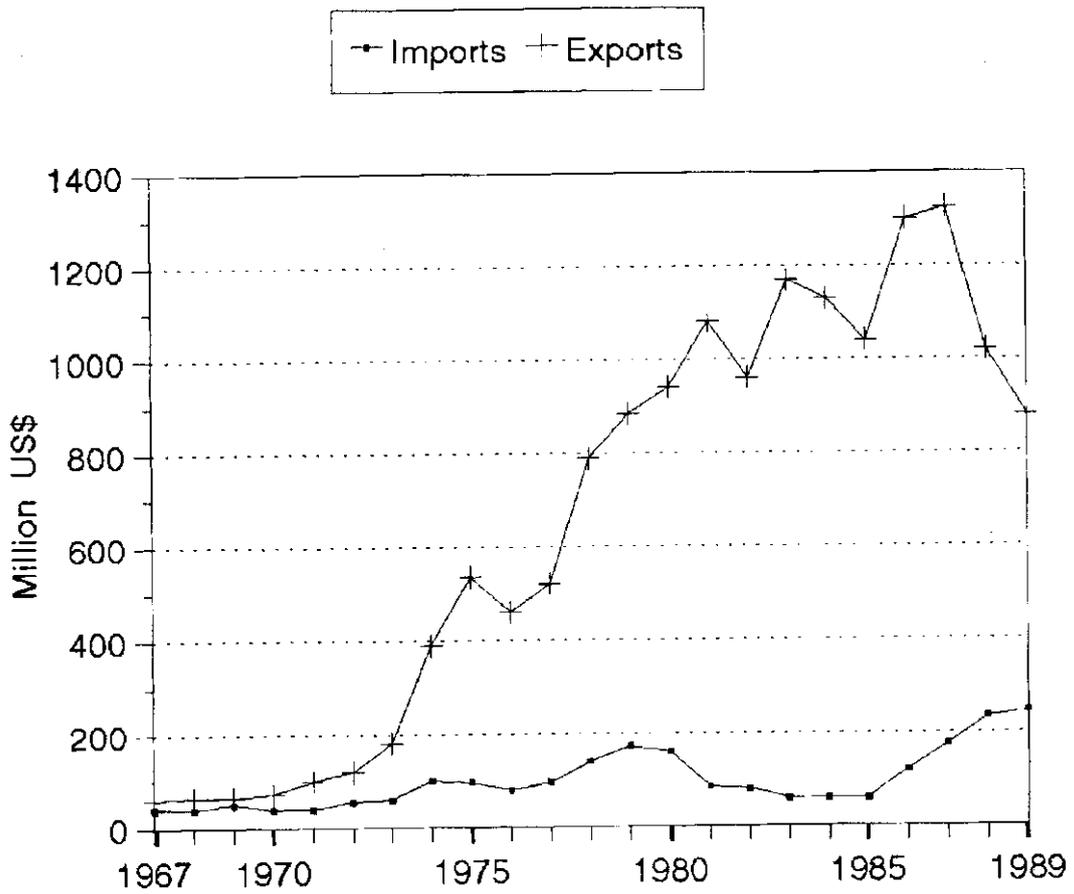


Figure 8 - Farm machinery trade in Developing Countries (Source: FAO AGROSTAT database)



Prof. Brian D. WITNEY
U.K

I'd like to raise a major issue, that has come out of both of these papers, and perhaps has a significant influence on the overall machinery market. Many economists take the view that labour is a national resource and if you have more efficient production in one area you reduce labour in that area and that then increases the national resource of labour for some other production process. Where is the growth going to come, to use up that national resource? Often we hear that there will be an increase in the service industries and maybe there will be an increase in the leisure industries. But with automation increasing in our global manufacturing base there is not going to be an overall increase in requirement for labour. Therefore, are we going to see the continual trend towards larger production units in agriculture? It could well be that we will see an increase in the part-time farming activity and therefore a continuation of the medium-sized farms. If that is the case, then there is going to be a change in our overall futuristic view of the production requirements in agricultural machinery. I would like just to say that in many of the developed countries we are seeing much greater concern for the quality of life and the increasing possibility through computer technology to have the mobile office, or the office based in the countryside. I think all these factors have to be taken into account when we are looking at the machinery market over the next 10-15 years.

J. SHARPLES

All I would say is that you stated that very well. That is a major concern with the economists, seeing increasing demands for labour as trade increases in those areas where we are competitive, and we are seeing that in the United States in those areas where we are competitive. The problem is that a displaced farmer doesn't necessarily serve as a good worker in a Boeing airplane factory. So, retraining plays an important role.

But your comments about part-time farming, especially in countries where there are job

opportunities off the farm, I think that is an important factor to consider in looking at machinery demand.

Prof. Jaime ORTIZ-CAÑAVATE
Spain

I want to ask Dr. Sardi de Letto about these figures that he indicates from the study made by the economists, i.e. that the impact in the world economy would be - with the application of the GATT, of the Uruguay Round - 120 billion US\$ a year. He said also that the study made by the OECD would be around 200 billion US\$ a year. Well, my question is that we, as engineers, normally give reliable numbers. I trust the study made by the economist, but I would like to know how these studies are made because in some cases the predictions the economists make for the future sometimes are not very reliable - at least in my country! I would like to know how it could be predicted, this big amount of money that could be obtained from this application.

G. SARDI DE LETTO

I mentioned the source of this broadcasting. Certainly I would not want to take the responsibility of these figures, but what we could imagine is that in the Uruguay Round for the first time we touch some sectors that were out of the previous GATT negotiations: I mean international trade of services for example, I mean intellectual property rights, and also investments, i.e. some sectors that certainly will contribute in an important way in the increasing of trade. Imagine the sector of services - banking, insurance, transport, telecommunications etc. - all these sectors until now were out of the multilateral rules. To have multilateral rules means to respect certain duties. Certainly, a benefit will be for everybody if the figures of the economists or the OECD will be correct or not - I don't want to enter into these details, but certainly we may imagine an increase for everybody. Of course I may imagine also that in these sectors developed countries could have major benefits in comparison to developing countries,

and it is for this reason that in the negotiation we touch also other sectors where we imagine that developing countries could have major benefits, for example textile sectors. It is for this reason that Italy for example considers the Uruguay Round a global negotiation: global negotiation in the sense that we have to have in mind the result on agriculture, on services, on intellectual property, on textiles. It is just on a global, overall consideration of the negotiation that we could estimate an advantage for everybody.

Dr. D.H. SUTTON
U.K.

I'd like to pick up a point that Dr. Sharples has made at the end of his excellent presentation where he said (I quote): "keep an eye on the developing countries as possible growth markets". I just wonder whether there is not a need for us to take a much more positive position in this particular area, because clearly there must be in the medium and long term a very good potential in developing countries for agricultural mechanization. I have perceived in recent years a very worrying decline in the importance attached to agricultural mechanization in food production generally and in particular in the developing countries. I have been working over the last 25 years with development assistance agencies and I just wonder whether those of us close to the needs of the developing country farmers shouldn't be taking a much more positive line in lobbying harder with development assistance Agencies (such as the World Bank and in Brussels) to try and convince them of the role of engineering in development generally and in particular of the role of mechanization in food production and development.

Dr. Adrianus RIJK
F.A.O.

Dr. Sharples briefly touched upon the Eastern European and former Soviet Union countries as a possible market for agricultural machinery: wouldn't we have to see them

more as a possible supplier and manufacturer of agricultural machinery? I recently visited Czechoslovakia and I was very much impressed there with the level of technology, the quality of the productions, but also even more striking was that many companies had already started manufacturing components and parts for German manufacturers of agricultural machinery. The same has happened with Poland, and of course there may be many Eastern European countries and former Soviet Union factories which still are not up to the standards, but this could very quickly be improved once they get into private hands and in particular with the cost of labour so low they could be a serious threat, I think, to many of the European and American machinery manufacturers. I gave one example: the Ladewagen (it's a German word), very popular machine in Germany and in The Netherlands, a selloff loading trailer, of a quality and capacity equal to what was marketed in Germany, was available for export at a third of the price in Czechoslovakia. I wonder whether this could not be a serious threat to the industry in Europe.

G. PELLIZZI

Yes, I think this is in the direction of what also Dr. Sharples has written: there will be in the future probably a shift in the production of agricultural machinery from the high labour cost to the low cost countries. There is no doubt.

J. SHARPLES

May I add one comment to that? When looking at those costs, also consider all the costs associated, beyond production, that also need to be covered in the price. For example, comparing US and Mexico, we have been looking at those issues very closely because of the negotiations for the North American Free Trade Agreement, and what we find is that in Mexico the labour cost in production is very low, that's true, but all the other costs associated with transportation infrastructure, the banking cost, the cost of doing business,

are really quite high. So, until their general economy and infrastructure is upgraded they still have very high costs associated with going beyond the production site and in marketing, transportation and so on. So consider, as you look at these countries, the total package of costs associated with production and marketing.

Dr. Antony C. WYLIE
Chile

I think it's interesting to maybe comment on a couple of the remarks which have been made. Obviously everybody here must be aware of the fact that, wherever subsidies or tariffs are restricting growth of agriculture in other countries, this is obviously impinging on the potential sale of agricultural machinery. And this is in fact happening: I think it happens in our country, it happens in other countries in South America. So the subsidies and the subsidized exports have to be looked at as a two-edged tool in this respect, and I agree with what has been said here: I think it's worth keeping in mind.

D.J. WHITE
U.K.

Dr. Sharples, I think, gave us a very succinct conclusion at the end of his talk. He said that "comparative advantage will play a larger role in determining where crops will be grown and where farm machinery will be produced", and of course our discussion has revolved around these points. I have a concern about those countries which have no comparative advantage. Who are they? What is the future for them? What are their solutions?

J. SHARPLES

As an economist looking at that issue, it's "comparative" advantage: every country is good at doing something and one of the automatic adjusters that helps a country, where things don't seem to be going right, to get their act together is the exchange rate. In the United States lately we've had a lot of difficulty,

it seems, in our trade situation; but since 1985 the value of the US\$ has fallen and all of a sudden we've become very successful exporters. That may be a poor example for some countries where it is not obvious where their comparative advantage lies, but I think that looking closely every country is good at doing something and that the exchange rate - the value of their currency - adjusts until they are competitive in exporting something.

Dr. Bernard CHEZE
France

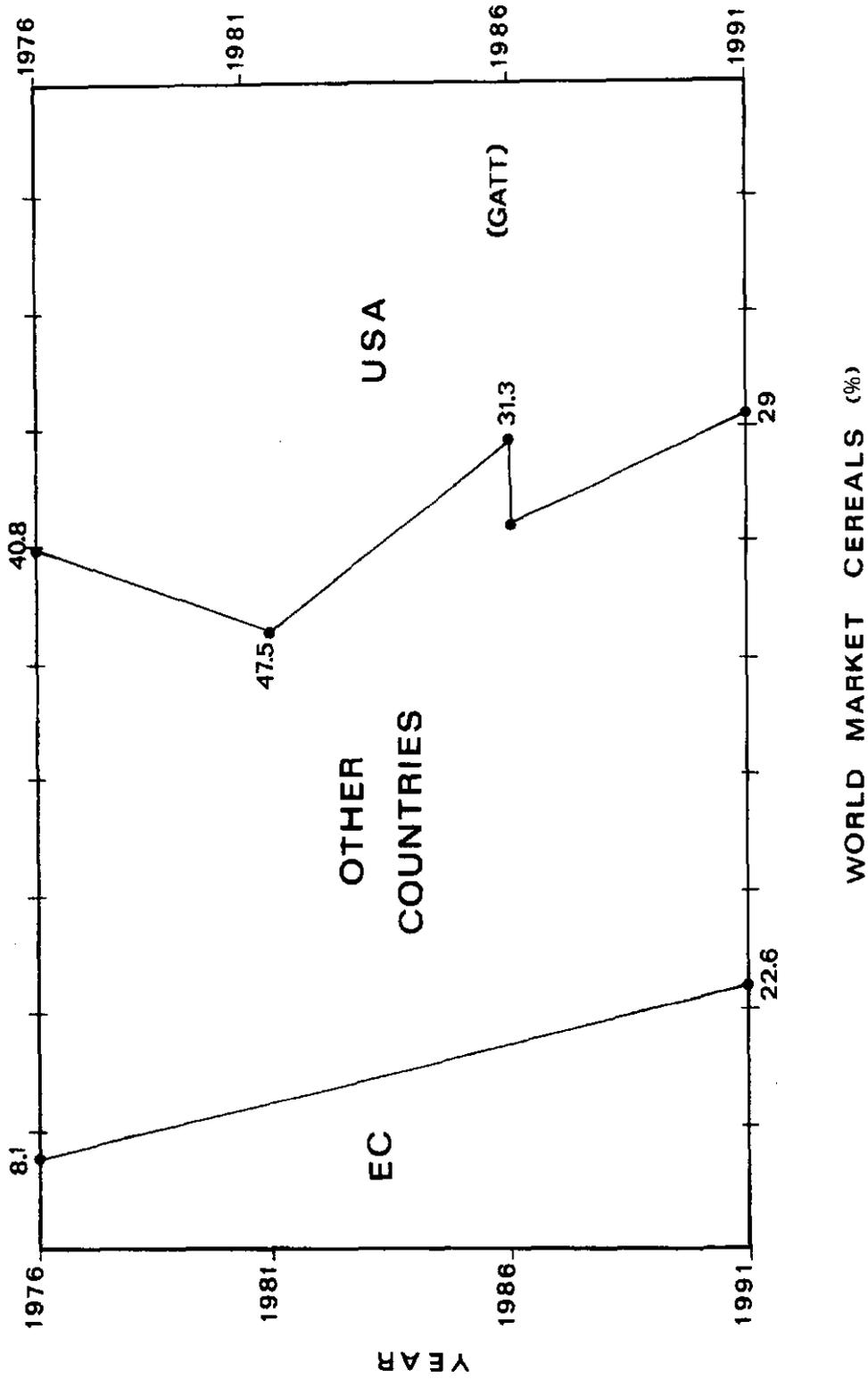
First, a small remark about the problem of low cost labour. I think it is more important to speak of low cost of production or, let's say more generally, a better competitiveness because you can obtain with a high level of technology a low cost of production in manufacturing or in agriculture and you can also have of course low labour costs; so you have to balance the two, but I think it is important not to focus only on the low cost of labour. That's the first point.

The second point was to try to make a small analysis of what could be the consequences of the GATT negotiations on the EC agricultural productions. This is a sort of forecast or hypothesis that is made. The first conditions, the aspect of the free access to markets: this will cause for the EC an increase of 4 Mt of cereals to be imported in the EC and between 3 to 5 Mt of what we call PSE (it's a substitution for cereals). That's the first point. The second point is if we realize a limitation of subsidies (that's also a proposal inside the GATT negotiations) of course it depends on the level of limitation. As shown in Figure A, if you limit at 19 Mt it causes to EC a reduction in exportations by 40 Mt - but 40 Mt correspond for the moment to the actual 15% set aside. If you take the level at 23 Mt, the consequence is only 10 Mt reduction in exportation. If you add to these two rules the aspect of tariffs the three conditions need to add to the actual 15% set aside 10% more. That means it goes to 25% of set aside or fallow. I think this causes a great problem because I've heard that in Germany for example,

where they reach more or less 6% of set aside, this aspect is not very well appreciated by people living in rural areas and so imagine if we have 25%. If nobody takes care of this 25% I think - I'm coming back to the quality of life - that there will be a problem both for people living

in rural areas, where they will not find any interest in staying in these areas, so there will be a sort of desertification (which is a work we are hearing from people in Europe actually), and also there is a great problem of landscape keeping.

Figure A - World market of cereals for EC, USA and other countries from 1976 up to 1991



G. SARDI DE LETTO

Two comments. The point is, on this matter, to put certain clear rules, and to put these clear rules it means to imagine a free access of a certain percentage, to reduce subsidies, and instead of the present system of the common agricultural policy (I mean levies, restitution for exporting), to put a clear system of tariffication, that gives a major point of departure for future negotiations in the GATT. Maybe it is useful to remind that until now there have been eight negotiations in the GATT, so we can't conceive that this negotiation, i.e. the Uruguay Round, will be the only one. These are a great step, to put clear conditions for a sector where there are different policies all around the world (there is a different policy also in Europe). To do so it is absolutely necessary to proceed step by step. That is the crucial point, because certainly to put this clear condition will have a negative impact for Europe. I have to say, to be honest, that if Europe decided to approach in a concrete way a negotiation also in agriculture it is not only because there is the Uruguay Round but it is also for internal purposes because, to be honest, the cost of the common agricultural policy is enormous. So it was necessary to reduce the impact of this cost, so in any way it was a step to do, but it is clear that also if it is true that for internal reasons the Community decide to reform common agricultural policy, it is evident that this could have an impact also for third countries. That is a point. I underline the fact that it is just a beginning of a process. It will require some time - ten years? That is a point: we don't think that the Community could engage for about ten years; maybe more than ten year will be necessary (I think that it will take more than ten years). But it will be really a great mistake not to begin. We have to begin, for internal reasons certainly but also for external reasons.

Prof. Ali Mohamoud EL HOSSARY Egypt

I would like to just clarify the point that there is a decline in the export of farm machinery

to the developing countries. This is partially due to the development of the local industries. Now they have some self-sufficiency, some of the equipment, and they are only importing some components. This may clarify the decrease in imports of whole machines in these countries.

Prof. Karl Th. RENIUS Germany

I would like to make a comment on the role of the technology level, coming back to Dr. Chèze. I think this is also the role of research in agriculture and the question is: should research support machinery development or not? We have a situation of overproduction and some people have the position that we don't need highly-developed machinery in order not to increase production still more. But I think there is a very interesting example against this position: Dr. Sharpies has mentioned that the US ag-machinery exports dropped dramatically and imports increased and that this tendency should be related to a concentration on big machinery because of farming structure. I agree, but I think this is not the only reason. I remember that colleagues from the US reported around ten years ago that the budgets for research were reduced dramatically in the US, and today we see what happened. So my message is that overproduction cannot be convinced by saving money for machinery research and development.

Prof. Richard O. HEGG U.S.A.

I respond to Prof. Renius' comments. I don't see there is a direct link between reduction in research related to the reduction in export of farm machinery. I think that actually, in the last three years, reductions in agricultural research in the United States have been much more significant. I look back at ten years ago as a more stabilizing situation than more recently; so I wouldn't put the link between those two.

K.Th. RENIUS

Yes, but please see the role of the machinery industry. Twenty years ago, a hundred years ago, North America was leading in development and production of machinery; today it is not in the first place. And the labour costs for manufacturing machinery, in Germany for instance, are much higher than in your country and in spite of this situation technology is so that the Europeans have become leaders. I think there are interactions between research support and the level of machinery development, I really think so.

Mr. Yoshisuke KISHIDA
Japan

I have some question to the two Speakers. I think that the discussion of the new Round wants to realize more fair competition in the agricultural industry. But in this world we have the very big farm and the very small farms, and I can say the majority is the small farms, especially in the developing countries. Also in Japan, China, Thailand, Korea, the average size is very small. I want to ask you what is the fairness of the competition in agriculture. My idea is that, if we want to realize a fair competition, we have to set up fair handicaps before we start the fair competition. For example at present, how is the Chicago price decided? I can say very few, rare, big farms with high productivity will decide the lowest price but other farmers (for example in a developing country, for example in Bangladesh the average size is only 0.6 hectares) how can they compete with such big farms? The problem is these big farms cannot supply all the food for everybody. That means our world relies on the existence of small farms. Then we have to think about how to reduce the gap among the farmers, among the people in the world. But I think the new Round, if it concludes, I think they will bring a big disaster for all the farmers in the world, especially for the smaller farms. Already we can find this tendency in many countries, not only in developing countries - for example in the US, in Canada. How many young people want to stay in farms? For example in Korea already the average number of the farmer's

family is only 3.8. All the young people shifted to the cities. In other developing countries there is also the same tendency because the trade conditions between the agricultural sector and non-agricultural sector are too bad for the agricultural sector. If we see the statistics in Europe - price of tractors, price of the organic input and the price of the farm products - the trade has been becoming worse and worse. Anyway, I think the fact is the fairness of the competition in the agricultural field. This is my question. Could you answer?

J. SHARPLES

I'll start first. Basically, the question of fairness is an ethical question that there really isn't an economic answer for. If it's an ethical question it's something that we have to deal with in our policy. So, in the context of how I view world agriculture, I can't in my profession directly include ethical questions but as a person concerned about agriculture I have those concerns. Basically, I am going to turn this over to a person on top of the policy scene here, to address that question. But I think it is a challenge to you as agricultural engineers to work on those issues of appropriate technology for the small farmer, to increase their productivity; also in many countries this releases some of their labour to work off the farm and that's a process that we have seen around the world in the developing countries, in countries that have already developed, and I would expect that we would be seeing that also taking place in the poor countries.

G. SARDI DE LETTO

If I may add just some comments on the point raised by the Japanese Colleague - I agree with him that there are different conditions all around the world. He mentioned the small farms existing in Japan: well, the same situation we may say exists in Italy, where we have the so-called "mountain agriculture", that is of course a different situation from the "plains agriculture", and so also the conditions or the results would be certainly different.

It is a matter of fact that the conditions in agriculture are different for many reasons, which sometimes are geographical reasons but also other considerations. There is, in European countries for example, a culture linked with agriculture that doesn't exist in other countries; this also is an aspect that has a certain importance to have in mind. Of course there are political and social aspects in all countries, I suppose, but the peculiarity of agriculture, the fact that it is not only an economic consideration that must be done, that is the real difficulty in the negotiations that we had in the past and that we have still now.

About the developing countries, well, I think that all the negotiations the world around, also in agriculture, have in consideration the situation in developing countries, in the sense that a special treatment for developing countries must be considered. I don't want to go into detail but this is one point. You mentioned Bangladesh: of course this situation must be considered.

Prof. Bassam A. SNOBAR
Jordan

My question is: who benefits from the subsidies? Farmers or consumers? And if the

subsidies are lifted, who will scream, the farmer or the consumer?

G. SARDI DE LETTO

If you put in a direct way this question, of course the subsidies, it seems that the farmers could have the major advantages, so there is certainly an interest for the market - if I may express myself this way - to reduce subsidies. But you have to keep in mind what could happen if this is done. It is for this reason that you have to proceed in a gradual way. I don't know whether this answers the question you put.

G. PELLIZZI

I should like to ask Dr. Marchenko to take the floor for ten minutes in order to explain what implications of GATT could be connected with the new situation in Russia, and then we will go on to discuss the final conclusion and recommendations for this subject. Please, Dr. Marchenko, the floor is yours.

Dr. Oleg MARCHENKO
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AGRICULTURAL
MECHANISATION PROBLEMS IN THE
PERIOD OF MARKET
ECONOMY INSTALLATION IN THE
RUSSIAN FEDERATION

1. Introduction

Contorted reforms and the installation of a market economy have been aggravating the political, social and economic situation in Russia, as well as in the other republics of the former Union. For this reason, the present state of crisis in the Russian farming sector may only be correctly assessed on the basis of an in-depth analysis of agricultural production in the pre-crisis period.

For many years the position of the Russian Federation in the world food market was characterized by an extremely high dependence on imports and an insignificant level of exports. Nonetheless, the satisfaction of the population's food requirement, considering the imbalance in nutritional values, stood at about 60-70% of international standards. The lack of efficiency in agricultural production could be explained by a number of reasons, the most important of which is its poor material and technical base and, most specifically, the unsatisfactory level of technological and engineering-technical maintenance.

2. Mechanisation of agricultural production

The level of mechanisation in crop production reached 60% in cereal production, 80% in vegetable planting, 43% in potato harvesting, 25% in vegetable harvesting, 25% to 50% in loading and unloading operations in forage production. The technological processing of milk and meat production was mechanized by 68% to 83%, poultry production by

92%. The level of electro-mechanisation in livestock production reached 60% (**Table 1**). Moreover, there was a chronic technical shortage in agricultural production. Farmers' demands for tractors and key machines and equipment were only satisfied to the extent of 55% to 88% (**Table 2**).

The technical level of livestock production technology can be assessed with the help of the data in **Table 3**. As they show, Russia in 1990 lagged behind the advanced European countries in labour productivity by 17 to 30 times in livestock production and 6 to 10 times in crop production, while energy expenditures per ton of product (grain, for example) exceeded the US level by 4.7 times (**Table 4**).

Based on annual production, Russian farm workers ranked last among the top ten industrialized countries in terms of productivity (**Table 5**). In this analysis, the indicator for each country was translated into a common currency (US\$) according to a parity of purchasing power in the national currency.

3. New form of farming

Reform in the agricultural sector has promoted the development of farming minstructures, the spread of leasing to state and collective farms, the appearance of family leasing collectives and family (peasant) farms,

In 1991, more than 60% of collective and state farms used lease farming - 51.6% of land, 39.1% of dairy cows, 37% of cattle, 38% of pigs, 54.1% of sheep and goats - but only 9% of them in all fields of production were fully turned over to the leaseholders (**Figure 1**).

The work efficiency of leaseholders, who constituted 25% of all collective and state farm workers, was practically twice as high. At the same level of crop yield and livestock productivity in 1991, they produced 55.4% of the grain (without corn), 41% of the potatoes, 39.5% of the milk, 34.3% of the beef, 32.6% of the pork, 46.3% of the mutton and 54.3% of the wool (**Table 6**).

Full lease farming in the former state and collective farms could reduce the expenditures of manpower and resources as well as the losses in agricultural products. In this case, the annual production per leaseholder could be expected to increase almost three-fold.

In recent years, family (peasant) farming has been intensively developed in the countryside. By the beginning of 1992, 150,000 family (peasant) farms had been formed, with the disposal of 6.2 Mha. The average farm size was 41 ha (Table 7). These farms only accounted for about 1% of total agricultural output.

The development of family farms is restricted by the absence of the necessary conditions for their installation and then by the poor material and technical base, the lack of sufficient financial support from the government, poor social and living conditions and often by the psychological rejection of private farming on the part of farm workers (**Table 8**).

The multibranch structure of most collective and state farms with significant land resources (5,000 and 9,000 ha average, respectively) is characterized by a costly, irrational variety of farm machinery and a relatively small tractor and truck fleet (50-55 tractors per farm against an average of 300-400 workers). The shortage of tractors in Russian agriculture (1.366 million units with power density of 0.4 kW/ha, versus a normal required average of 2 kW/ha) and other agricultural equipment makes the further development of family farms problematic, since every farm must have at least one tractor. At present, each family farm has an average of only 0.52 tractor (**Table 9**).

Approximate calculations indicate that in the initial stages of evolutionary reform in the agroindustrial sector, tractor production must be increased by 1.7-2 times. The severing of economic ties between the agrarian sector and the industrial complex, as well as high prices for technology, fuel and energy resources, have caused a reduction in the production and supply of farm machinery. As a result, total agricultural production has declined by 9-16%.

Now, with production declining, the relationship between the agrarian and industrial sectors has become essential for their survival.

4. Russian farm machinery manufacturing complex and CIS problems

The farm machinery and automotive manufacturing complex (within the framework of the CIS) was one of the most complicated industrial sectors. The industrial potential included 760 associations and enterprises, 300 plants with 2.5 million workers. They were capable of producing around 3,000 different types of machine at a pace of 700 car and trucks, 170 tractors and over 510 farm machines per hour.

The complex (AO "Avtoselkhozmacholding")* was characterized by mass production methods, a high degree of specialization and concentration and widespread interstate connections.

As an example, under cooperative arrangements, Russian enterprises supplied over 8,000 different units, components and semi-finished products and received over 4,000 from the other CIS countries (**Figure 2**).

Regarding intra-CIS reciprocal equipment shipments, the other countries shipped 50-60% of their output to Russia, while Russia shipped 42.2% of its output (**Figure 3**), equal to twice the value of the other countries' volume.

Production of the principal types of farm equipment (tractors, harvesters, ploughs, drills, etc.) was concentrated primarily in Russia, Byelorussia, Kazakhstan and the Ukraine (Table 10).

The peculiar feature was that these four countries monopolized the production of such key machinery as tractors, harvesters, etc.; Russia accounted for 100% of the grain and potato harvesters and post-harvest grain processing machines and equipment; the Ukraine furnished the corn and sugarbeet harvesters,

Byelorussia 60% of small tractors, 76% of potato planters and 100% of potato diggers, etc. When the Union was dissolved and former economic ties severed, production plummeted, particularly during the price liberalization at the start of 1992. This prompted a rise in equipment prices, a 30-35% decline in production, with some machines dropping 40-48%, and the deterioration of machinery quality and reliability. A number of enterprises were forced to shut down production temporarily (2-3 months) because of a shortage of funds, raw materials and components.

A lag in the restoration of interstate relations and the economic disorders has forced some of the machinery manufacturing plants to re-specialize, as most of them were dependent on Russian raw materials and components and financial resources to cover future equipment deliveries. The sharp drop in the ruble exchange rate only aggravated the shortage of foreign currency needed to purchase machinery components in extremely short supply.

All this has caused a sharp rise in the price of farm machinery (80-100 times) which, along with a lack of solvency in the agricultural sector (the selling price of farm products has only risen by 10-15 times), has led to a sharp reduction in machinery manufacture. This fact has further deteriorated the financial situation of the machinery manufacturing plants.

At the beginning of 1991, for example, the DON-1500 grain harvester and the Polesje forage harvesting combine cost 50,000-60,000 rubles, which rose to 100,000-110,000 rubles by the end of 1991. After the directive forcing price increases on equipment in January 1992, the prices of these harvester leaped by 13-15 times (to 1.5-1.7 million rubles) (**Figure 4**). Nevertheless, farm machinery prices were still lower than world prices. To cite an example, the forage harvesters of John Deere (model 5830) and Stayer (Champion-3000) of the same class as the Polesje cost US\$ 100,000-140,000, which is equivalent to the cost of 100 t of meat (carcass weight). The cost of the Polesje is equivalent to 50 t of meat.

5. Conclusions

Further development in competition between the various farming systems in Russia's multistructural agriculture (including private farms) can be effectively promoted if the necessary legislation on land ownership is finally passed.

Effective credit and low taxes to farmers must also be provided at the earliest, as well as a control on price parity for agricultural and industrial products, to enable farming to retain most of its profits and thus accelerate development.

Russian agriculture should be constantly financed by the government to radically improve the infrastructure of production, processing and marketing of farm products (including the creation of cooperatives, dealerships, contractors, on-farm processing, transportation and trading systems and agricultural equipment repair and maintenance services).

The Russian Federation, as well as the other CIS countries, must quickly increase the production of those types of farm machinery for which reciprocal shipments were so sharply reduced. So Russia plans to organize the manufacture of 17 new tractor models of different power levels (annual production of wheeled tractors drawbar pull class: 3 t, 20,000 units; 2 t, 10,000 units; 1.4 t, 60,000 units; 0.2 t, 45,000 units) as well as equipment for forage, forage-beets, corn, livestock production and others.

The creation of national production of the traditional machine line, which includes more than 2,000 models, in the very near future, however, would require a great increase in resource consumption. It is beyond the capacity of any one CIS country.

It should be considered that Russia and some other CIS countries will be forced to organize the production of such specific agricultural crops as cotton, for example, that are not traditional for the soil and climate conditions in

these countries. At present, to find a way out of the crisis in the agroindustrial sector, the urgent problem of supplying the market with farm machinery must be resolved.

To achieve this, it will be necessary:

- to restore economic relations among the US countries, to revive the reciprocal shipments of raw materials, components and finished products;
- to continue producing farm machinery in Russia and, since the old machinery manufacture has ceased, partly re-specialize the enterprises to cover the urgent needs of Russian agriculture;
- to find a way to import initially the components in extremely short supply and key farm equipment from traditional partners and other countries;
- to begin reequipping the farm machinery manufacturing complex step by step, by converting current facilities to the

use of up-to-date equipment; to begin manufacturing both components and machines, instead of importing them; to develop high-quality farm machinery service firms in the countryside.

The quickest, most effective way to provide Russian agriculture with modern machinery, equipment and high technology is to attract the high potential of foreign machinery manufacturers and form mutually beneficial joint ventures to produce main components and key machines and equipment and machinery service systems in Russia.

References

- [1] People's economy RSFSR in 1990. RSFSR Goscomstat, M., 1991.
- [2] The State Agro-food and Agricultural Trade. OECD, Paris, 1991.
- [3] Statistical data from AO Avtoselkhoz-mach-holding (V.P. Zhukov)

Table 1 - Mechanisation level in crop and animal production (1990)

INDICATORS	%
Grain (without corn)	61
Potatoes	43
Vegetables:	
- planting	80
- harvesting	25
Load-unload works:	
- square bales in hayshed	50
- hay	50
- chopped wilted grasses	33
- haystack forming from risks	25
Animal production farms (*)	68
of which:	
- dairy cows	83
- pigs	76
- sheep	22
- poultry	92

(*) level of electro-mechanisation of animal production: 60%

Table 2 - Degree of satisfaction of Russia agriculture in some type of agricultural machines

AGRICULTURAL MACHINES.	%
Post-harvest equipment	55
Pick-up	60
Cultivators	65
Tractors	70
Ploughs	70
Drills	70
Mowers	75
Forage harvesters	75
Potato harvesters	80
Grain harvesters	85
Windrowers	90
Sugar-beet harvesters	95
Fertilizer applicators	100
Irrigation machines	100

Table 3 - Forage and labour expenditure to produce 1 ton of animal product (1990)

INDICATORS	FORAGE		LABOUR	
	RUSSIA (t)	EC (t)	RUSSIA (t)	EC (t)
Milk	1.44	0.8	64	18
Meat:				
- cattle	13.5	5.2	370	22.0
- pigs	8.3	4.2	209	6.6

Table 4 - Labour and energy consumption for producing 1 ton of grain (1990)

CONSUMPTION	RUSSIA	USA
Labour (h/t)	14.4	1.3
Energy (toe/t)	0.214	0.043

Table 5 - Annual agricultural production in US\$ per capita (1990)

COUNTRY	PER CAPITA PRODUCTION (10 ³ US\$)
Russia	3.2 ≈8(*)
Japan	8.0
Austria	14.0
Italy	15.0
Germany	16.0
UK	20.0
France	20.0
Finland	25.7
Canada	31.0
USA	35.5

(*)Considering the lease farms.

Table 6 - Efficiency of livestock production on lease farms

PRODUCTION	YEAR		
	1989 (%)	1990 (%)	1991 (%)
Cows	13.8	27.5	39.5
Milk	16.8	26.1	39.1
Cattle	12.2	22.7	34.3
Meat	15.8	25.3	37.0
Pigs	13.8	24.5	32.6
Meat	18.3	29.2	38.0
Sheep and goats	17.6	32.3	46.3
Meat	24.8	40.2	54.1
Wool	20.8	43.1	54.3

Table 7 - Development of peasant (family) farms and agricultural cooperatives

INDICATORS		YEARS			
		1989 (%)	1990 (%)	1991 (%)	1992 (%)
Farms	(10 ³ units)	0.231	4.43	24.0	150
Arable land	(10 ⁶ ha)	0.012	0.204	0.985	6.2
Av. farm size	(ha)	50	46	41	41
Farms:					
< 5 ha	(%)	-	-	-	18
5-50 ha	(%)	-	-	-	57
51-100 ha	(%)	-	-	-	15.5
100-200 ha	(%)	-	-	-	6.5
> 200 ha	(%)	-	-	-	3.0
Ag. cooperatives	(units)	1137	3722	5018	na

Table 8 - Living and social conditions in towns and country-side (1990)

FACILITIES	TOWN (%)	COUNTRY (%)
Water supply	94	49
Central heating	92	37
Sewage system	92	37
Hot water	79	19
Gas	72	78
Kinder-garten	70	56

Table 9 - State, collective and peasant (family) farms (data for comparison)

INDICATORS		STATE AND COLLECTIVE FARMS	PEASANT AND FAMILY FARMS
Farms	(10 ³ units)	25.8	150
Arable land	(10 ⁶ ha)	128.6	6.2
Av. farm size	(ha)	4985	41
No. per one farm:			
- workers	(person)	320	1-3
- tractors	(units)	53	0.52
- grain harvesters	(units)	16	na
- trucks	(units)	30	na
- cows	(head)	792	na
- cattle	(head)	1423	na
- pigs	(head)	1430	na

Table 10 - Tractors and agricultural machines produced in CIS

NAME OF MACHINES	RUSSIA (%)	UKRAINA (%)	BELAR. (%)	KAZAKH. (%)	UZBEK. (%)	OTHERS (%)
Tractors:						
– small	5	25	60	–	–	10
– agricultural	36.5	25.7	22.3	7.4	5.4	2.7
– industrial	78.5	–	–	21.5	–	–
– forestry	98	2	–	–	–	–
Harvesters:						
– grain	100	–	–	–	–	–
– corn	–	100	–	–	–	–
– sugar-beets	–	100	–	–	–	–
– forage	31.7	33.5	34.8	–	–	–
– potatoes	100	–	–	–	–	–
Potato planters	24	–	76	–	–	–
Potato diggers	–	–	100	–	–	–
Ploughs	52	46	–	2	–	–
Cultivators	52	13	–	21	14	–
Drills	29	59	–	9	3	–
Mowers	43	–	–	57	–	–
Pick-up	–	–	10	–	–	90
Windrowers	–	100	–	–	–	–
Irrigation machines	50	50	–	–	–	–
Post-harvest equipments	100	–	–	–	–	–
Plant protection machines	–	77	–	–	8	15
Fertiliser applicators	62	38	–	–	–	–
Machines for animal production	32	29.4	22.7	5.3	0.6	10

Figure 1 - Development of lease farming (1989-1991) in terms of: (A) number, land and workers; (B) efficiency of crops production (% of total farm production)

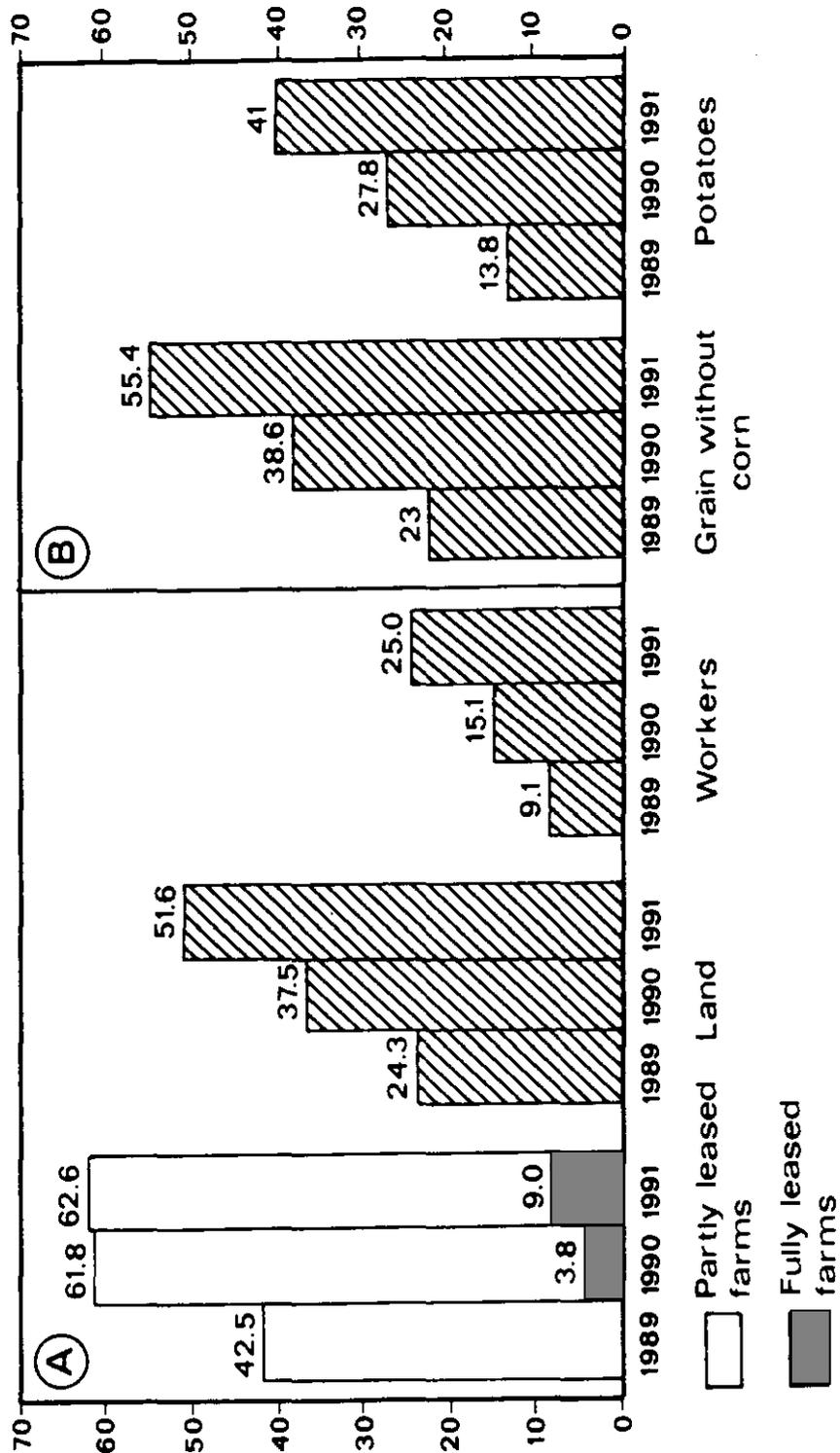


Figure 2 - Cooperation in production of components of agricultural machines in CIS

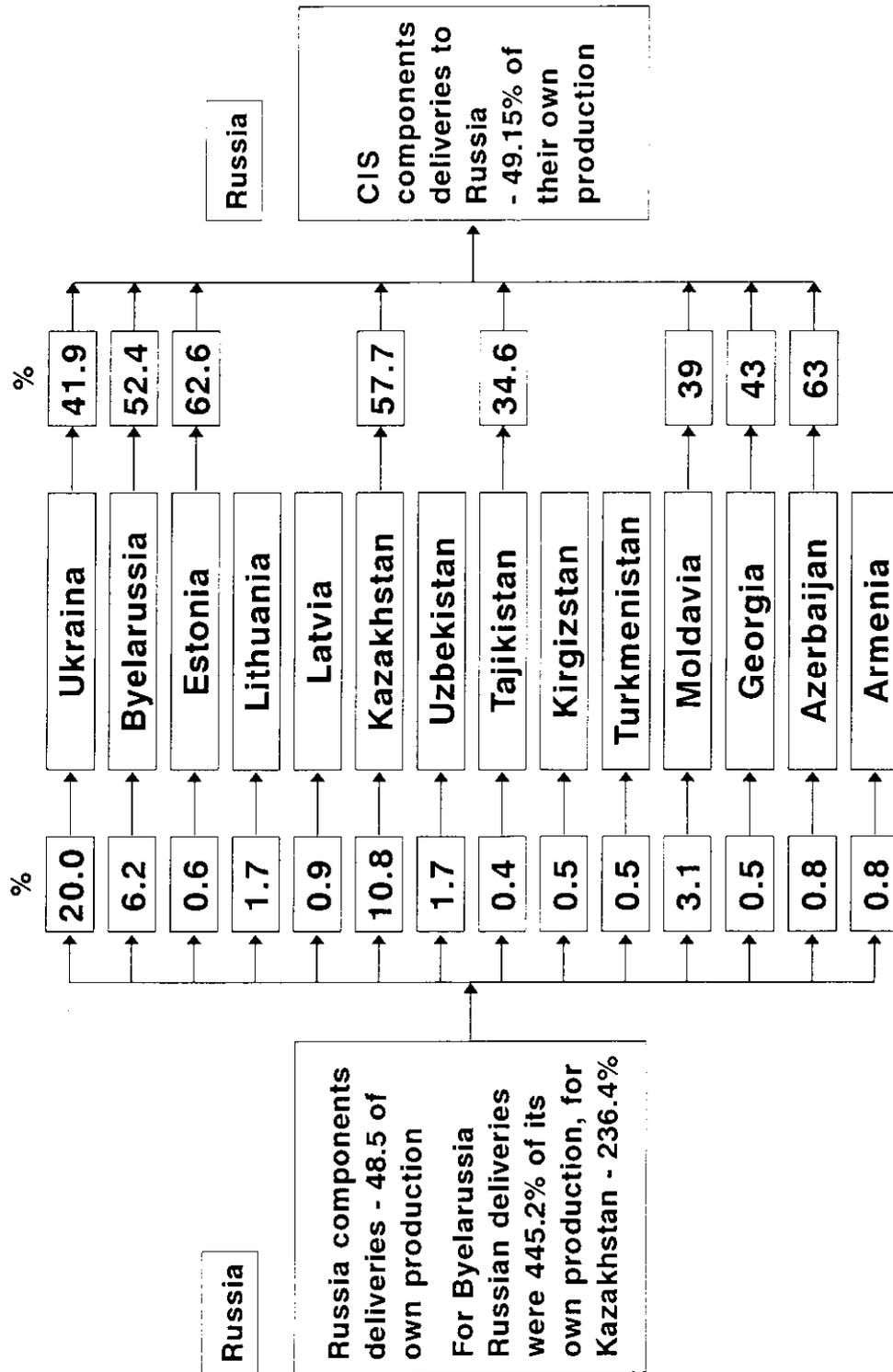


Figure 3 - Mutual deliveries of agricultural techniques in CIS

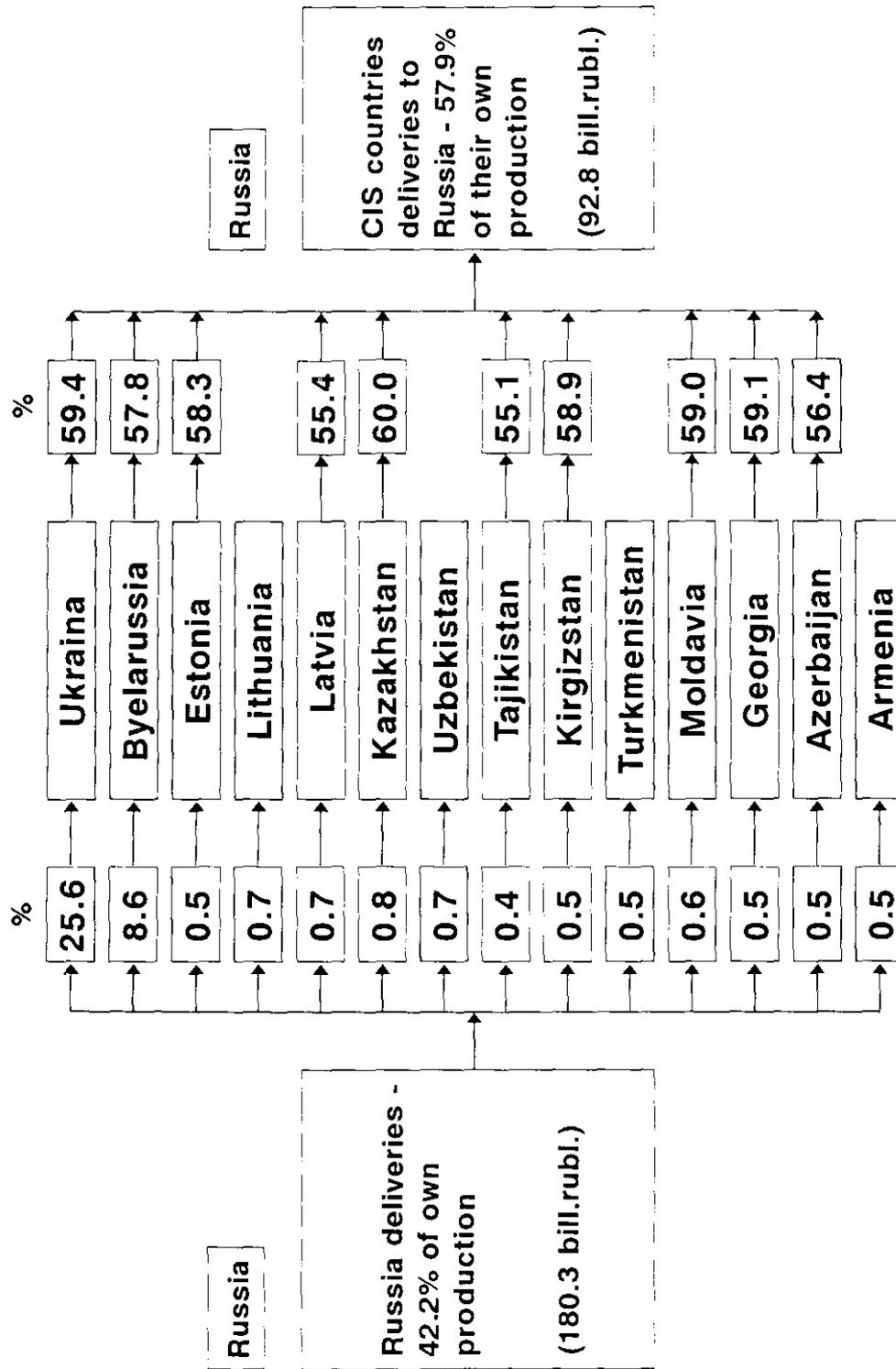


Figure 4 - Inflation increasing of forage harvester prices (1991-1992) Prices in 10³ rubles

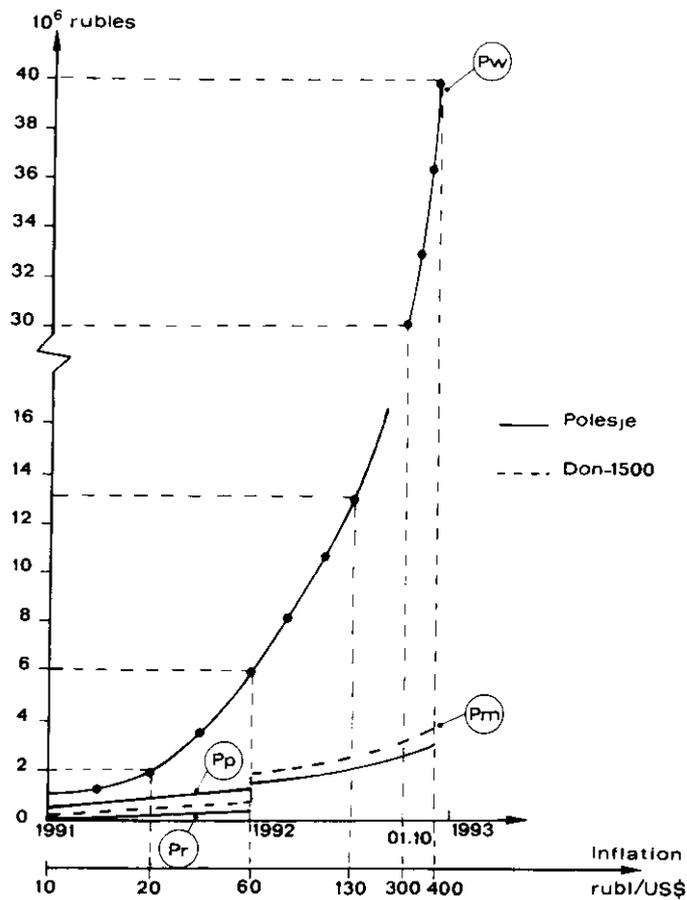
Pw = P world (rubles) = 10⁶ US\$

Pm = P market

Pp = P procurement

Pr = P retail

YEAR	POLESJE	DON-1500
1990	50	65
1991	50 65 105	65 70 115
1992	1500 2500	1700 2700
Oct. 92	3000	3200



G. PELLIZZI

Thank you very much, Dr. Marchenko, for this general and dramatic view of the Russian situation. It would be very interesting to think about this problem in the future.