FARM MACHINERY

Zero-Till Drill

Introduction

Conservation Agriculture (CA) refers to a range of soil management practices that minimize effects on composition, structure and natural biodiversity and reduces erosion and degradation. Such practices include direct drilling or zero-tillage. Land preparation for wheat in rice-wheat rotation is an energy-intensive and time consuming process. For this reason wheat sowing usually gets delayed, especially in basmati growing areas, resulting in low yields. Therefore, the concept of zero-tillage sowing method was considered. PARC has made intensive efforts in introducing this technology in the country. Sowing of wheat in zero-tillage culture minimizes the intercrop gap and crop yield is substantially improved.

Technology Development, Development and Demonstration

Farm Machinery Institute, PARC, Islamabad has designed and developed zero-tillage drill to suit farming conditions. The drill is now being manufactured and marketed by local farm machinery industry. More than 25 manufacturers are currently producing this drill and over 3500 operating units of the machine are available with farmers in the country.

Technical Specifications

Power requirement	: 35 kW (45 hp) tractor
Field capacity	: 1 acre/hour
Operating cost	: Rs. 350/acre
Savings	: Rs. 1700/acre

Key Reference

B. Raza, S. A.Kalwar, and H. S. Mahmood. (2006). Manual on "Zero Till Drill its uses, precautions and repairing"A joint Publication of FMI and CABI, South Asia Centre Rawalpindi

Wheat Straw Chopper-cum-Blower

Introduction

Combine harvesters are gaining popularity in Pakistan for timely harvesting of wheat. These harvesters are concerned with the grains only and leave high stubbles and machine-ejected straw in the field. Due to non-availability of proper technology,

farmers generally burn this left over straw to clear their fields for subsequent crop. This phenomenon has given rise to three major issues: environmental pollution associated with fire hazards at farm level; burning of rich soil organic matter; and loss of valuable commodity i.e. finely chopped wheat straw (*bhoosa*) which is a common cattle-feed and has good market potential. Therefore, a technology which could provide *bhoosa* to feed their cattle throughout the year and earn a reasonable amount of money through its sale was highly demanded by the farmer.

Technology Development, Demonstration and Recommendation

Keeping in view the farmer's demand, Farm Machinery Institute, NARC identified and acquired a tractor mounted wheat straw chopper-cum-blower from India through Rice-Wheat Consortium. The machine was commissioned at FMI workshop and tested at NARC fields during wheat harvest 2001. The results were quite encouraging. Hence, further extensive field testing and demonstrations were conducted at farmer's fields during wheat harvest 2002. Effective field capacity, field efficiency, fuel consumption, operational cost and *bhoosa* recovery were ascertained to be 0.8 acre/hr, 60 %, 5-6 liters/hr, Rs. 750/hr and 400-600 kg/hr respectively.

The machine was adapted and commercialized by conducting field demonstrations through local industry. Technical assistance was provided to collaborating manufactures for its indigenization at Daska, Lahore, Gujranwala, Hafizabad, Faisalabad and Multan. Seven manufactures are producing the machine locally and its more than 250 units were in operation during 2006 wheat harvesting season resulting in 4.9 million rupees annual financial benefit to the farming community. Furthermore, the extensive use of straw chopper would help in conserving the natural environment to a considerable extent besides complementing the use of modern combines in Pakistan.

The Technology

Wheat Straw Chopper-cum-blower is a trailed-behind machine both for transport and field operation modes. It harvests the stubbles as well as picks up the combine-ejected straw from the field, chops it into *bhoosa* and blows it into a trolley hooked at its rear. It can be operated with a greater than 50 hp tractor with 2.2 m width of cut

Key Reference

Zafar, A. W., G. Shahzad and N. Amjad. (2002). Management of straw in combine harvested wheat fields: issue and its solution. Paper presented at National Workshop on Rice-Wheat Cropping System Management, NARC, Islamabad. December 11-12.

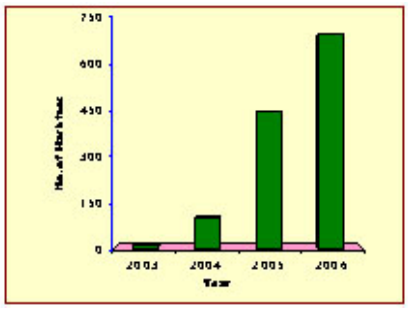
High Capacity Rice Thresher

Introduction

Rice is the second major staple food crop in Pakistan and is grown in all four provinces of the country. After harvest, rice is threshed with manual beating, bullock/tractor treading followed by manual cleaning. With this conventional system, the rice threshing season continues for 3 to 4 months in Sindh and Balochistan provinces. This system is highly laborious, time consuming, deteriorates rice quality and the harvested rice is exposed to bad weather conditions. To overcome these problems a high capacity rice thresher was introduced in rice growing areas of Sindh and Balochistan provinces.

Technology Development, Demonstration and Recommendation

In order to mechanize rice threshing, a tractor PTO operated high capacity (throw-in type) rice thresher was imported from Thailand. The machine was tested on local varities at Rice Research Institutes Kala Shah Kaku and Dokri. After incorporating minor adjustments in the machine, it was extensively tested on IRRI varieties. The performance of the machine was encouraging. As a result, local manufacturing of the machine was initiated. Six manufacturers are now producing this machine in various localities (Faisalabad, Lahore, Rahim Yar Khan, Nawab Shah, and Larkana). More than 700 units were purchased by the rice growers and these are now in operation in Sindh and Balochistan provinces.



Due to extensive demonstrations in Sindh and Balochistan provinces, it is now the only popular machine in the rice growing areas. It not only saves the time (reduces the threshing season from 4 months) but also minimizes grain losses, improves quality of rice which ensures better market prices. The operating cost is just Rs. 190/- per tonne and the financial

benefit to the rice grower is more than Rs. 210/- per tonne. The net saving from one machine is Rs. 0.5 million per season.

Key References

Zafar, A. W. (2005). Adaptation and commercialization of throw-in-type rice thresher. A report submitted to Agricultural Linkages Programme, PARC, Islamabad.

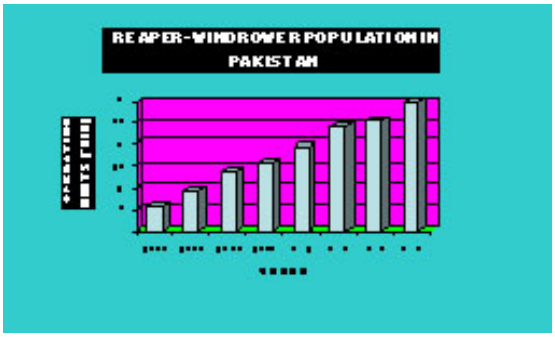
Reaper-Windrower

Introduction

The use of high yielding wheat varieties (HYV), fertilizers, irrigation practices and tractors for improved cultural practices brought about a tremendous increase in yield per acre and total production. This increased production also brought about a need for additional agricultural mechanization. During the harvesting season, there was a shortage of labor. This labor shortage, coupled with heavy rains, caused a large quantity of wheat loss each year. A solution to the problem was a partially mechanized system involving a "reaper-windrower" which could be operated with a tractor. After reaping, farmers could then gather the crops for mechanical threshing. This technology was relatively simple and less expensive as compared to the combine harvesting.

Technology Development, Demonstration and Commercialization

The Farm Machinery Institute (FMI) of the Pakistan Agricultural Research Council introduced the reaper-windrower in the early 1980s. The design was based on a Chinese machine. These imported machines were not successful in Pakistan. The indigenous machines were satisfactory, but needed improvement. Following considerable improvement of the machines, FMI was successful in convincing manufacturers and farmers to adopt this innovative machine. Many demonstrations and exhibitions were organized throughout Pakistan for industrial extension of the reaper-windrower. In the middle of 1980s, manufacturers started manufacturing and selling reaper-windrowers to farmers.



The Technology

The reaper-windrower harvests and windrows wheat and rice crops. It is a tractor front mounted machine. It is an intermediate technology between manual and combine harvesting. It saves time and labor. It is an important technology to save *bhoosa* for cattle feeding contrary to combines. There are 30,000 units in operation with farmers (2006). Its operating cost is Rs. 1800 per hectare. Its financial benefit is Rs. 1500 per hectare mostly resulting through timeliness of operation and reduced labour input. Its per annum benefit to the country is Rs. 2579 million and total benefit of Rs. 15,000 million since 1985.

Key Reference

Akhtar, J., Ahmad, I. S. and Z. U. Rehman. (1982). Test Report 2.0 Meter AMD Reaper-windrower. Agricultural Machinery Division, ARC, Islamabad.

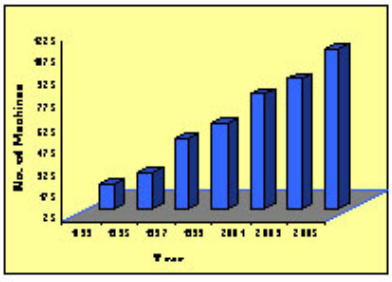
Groundnut Stationary Thresher

Introduction

Groundnut is an important cash crop of rain-fed areas particularly *Potohar* Region. It is grown on an area of 0.260 million acres with a total production of 0.076 million tonnes. In mid eighty's, harvesting and threshing was done manually as no proper machinery was available. Traditional harvesting and threshing was labourious, time consuming and very tough job for family labour, which was understood to be one of the main bottlenecks for low national per acre yield of this crop.

Technology Development, Demonstration and Recommendation

During 1986-87 FMI initiated a project for development of groundnut stationery thresher for assisting the poor farmers. At start, a prototype machine based on an axial flow principle was designed, which was driven by a diesel engine. Prototype machine was tested at farmer's field in *Potohar* and NWFP. Results were encouraging. Later on it was converted to tractor PTO. The technology was extensively demonstrated at different field sites for its commercial adaptation.



Machine field capacity was found to be 1200 kg per hour (crop intake) with threshing efficiency more than 98%. The power requirement is tractor PTO or 10-15 Kilowatts diesel engine. The operating cost is about Rs. 1 per kg of output pods. The

price of machine is about Rs. 70,000. The technology has been extensively field demonstrated in groundnut growing areas of *Potohar* and other parts of the country in collaboration with BARD Operational Research Sites and BARI Chakwal.

The Technology

The recommended groundnut stationary thresher is a tractor PTO operated machine operated on axial flow principal. It is simple to understand, easy to operate and equally good for threshing groundnut crop immediately after harvesting and minimum sun-drying. Now-a-days groundnut stationary thresher has two versions; one FMI indigenes design with air fan for cleaning and auger for output delivery and second with two separate heavy duty blowers. The new version of machine was field tested last year near Fateh Jang. The results indicated that the difference in between the output capacities of both machines was very much similar but the prices differed significantly. The price of new version is more than Rs. 120,000 rupees. Recent groundnut field survey indicated that the use of mechanical thresher is about 100% in the area. Presently more than 9 manufacturers are manufacturing groundnut digger commercially and marketing. More than 1200 units are in operation.

Key Reference

Zafar, A. W., M. S. Kalwar and M. T. Anwar. (1997). Design and Development of FMI Axial Flow Groundnut Thresher; Agricultural Mechanization in Asia, Africa and Latin America (AMA), Japan. Vol.28: No.1.

Groundnut Digger

Introduction

Traditionally, harvesting of groundnut was done manually as no proper harvesting machinery was available during early eight's. Manual harvesting is labour intensive, time consuming and boring fatigue for labour especially family labour. Reportedly this was one of the main bottlenecks for increasing acreage and per unit crop production.

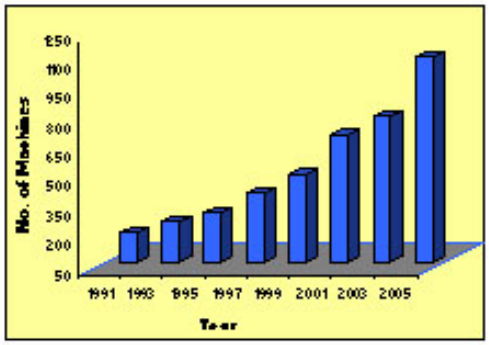
Technology Development, Demonstration and Recommendation

During 1982-83 FMI started the development of a tractor mounted digger for groundnut harvesting. After continuous efforts for couple of years, a prototype machine was developed. It was a simple machine, consisting of main frame, horizontal blade and two depth control steel wheels. It was a tractor mounted machine. Draft is used to pull it through the soil during field operation. Digging depth is controlled with two depth wheels by tractor hydraulic system. Machine was successfully tested at

farmer's fields in Punjab, sindh and Frontier Provinces. Effective field capacity of machine was found to be 0.70 acres per hour. Power requirement is 35 to 45 Kilowatts tractor. Operating cost is about Rs. 500 per acre. The technology has been extensively field demonstrated in groundnut growing areas of *Pothwar* and other parts of the country in collaboration with BARD Operational Research Sites in Punjab & NWFP and BARI Chakwal.

The Technology

The recommended groundnut digger is simple to understand, easy to operate and effectively can be used in sandy and/or loose soils. It is not much effective in hard and clayey soils. Recent groundnut field survey indicated that majority of farmers are using FMI Groundnut Digger for harvesting their groundnut crop. Presently, more than 5 machinery manufacturers are manufacturing and marketing it. Price is about Rs. 16,000. Now-a-day more than 1000 units are in operation.



Key References

Amjad, N. (1987). Testing of Groundnut Digger in Pakistan. ARNAM Newsletter No. 22, Philippines, April.

Zafar, A. W., and Munawar K. (1986). Efforts towards Mechanization of Groundnut Production in Pakistan; Proceedings of National Groundnut Workshop held at NARC, Islamabad, Pakistan, Feb. 17-19.

Wheat–cum–Canola Thresher

Introduction

Rapeseed and Canola are grown on an area of 0.248 and 0.117 million hectares with a total production of 0.215 and 0.173 million tonnes, respectively. Its harvesting is done manually with sickle and threshing with stick beating or tractor treading. Traditional threshing is labour intensive, time consuming and gives poor quality seed output, which is one of the main constraints in increasing area under canola crop for enhancing domestic edible oil production.

Technology Development, Demonstration and Commercialization

A project for development of a multi-crop thresher was initiated for threshing rapeseed/mustard and canola crop. A conventional wheat thresher was modified at FMI Prototype Workshop. Prototype machine was evaluated at farmer's field near Bhara Kahu during rapeseed harvesting season 2003.

Machine was tested at three different threshing drums peripheral speeds; 500, 550 and 600 rpm for three crop moisture levels; 22%, 18% and 14%. Thresher performed best with speed of 550 rpm and crop mc 22%; at which threshing capacity was 372 kg per hour with threshing efficiency of 99.6% and fuel consumption of 4.6 litres per hour; while the total machine loss and seed damage was o.3% and 0.2%, respectively.

A commercial unit of modified machine was manufactured by a manufacturer located in Faisalabad with technical assistance from FMI and handed over to FMI for performance evaluation and extensive field demonstrations. Machine output capacity was found to be 460 kilograms per hour. Labour requirement was found to be 11 man-hours per tonne of seed output as compared to 56 and 42 man-hours for traditional threshing with tractor treading followed by winnowing in addition to 3.5 tractor working hours be required, respectively. Total operation cost was found to be Rs. 1,250 as compared to Rs. 2,800 per tonne of seed output for traditional threshing. The machine was extensively demonstrated to farmers and four machinery manufacturers in Punjab and NWFP Provinces.

The Technology

The Wheat-cum-Canola Thresher is a tractor PTO operated, a multi-purpose machine equally good for threshing wheat as well as rapeseed/mustard/canola and other small seeded crops. All drives are optioned with variable speed as per requirement of different crops. Crop feeding is very easy due to feeder with platform. Easily replaceable sieve system has been designed and installed for threshing different crops.

Key References

Shahid, LA; AW Zafar and N Amjad. (2006). Modification and Field Performance Evaluation of Conventional Wheat Thresher for Rapeseed. Journal of Engineering and Applied Sciences, 25:95-103.

Mobile Flat-bed Dryer for Sunflower

Introduction

Sunflower and canola are most promising oilseed crops, because of high oil content, and these are attractive for the market trend towards products that help to reduce blood cholesterol levels. Autumn sunflower can be grown successfully in Pakistan, but after harvesting and threshing it is not easy to dry in sun because of cold weather. Therefore, appropriate

drying equipment is needed to increase the production of autumn sunflower in Pakistan.

Technology Development, Development and Demonstration

Mobile flat-bed dryer was fabricated at Farm Machinery Institute, NARC, Islamabad. The dryer consists of a wheel adjustment assembly, a frame, a plenum chamber, a grain container, an engine, a diesel fired furnace, and an axial flow fan to force hot air through plenum to grain bed. The grain container holds the grain above the plenum chamber on a false floor through which the air is forced. A 65-cm diameter axial flow fan was used for forcing the drying air through grain bed. It is powered with a 5.7 kW diesel engine with V-belt and pulleys arrangements.

The mobile flat-bed dryer was preliminary field evaluated for drying sunflower in November and December, 2005 at Faisalabad. Experiments on sunflower indicated that the average drying temperature was about 58ºC. The dryer required about 3 hours to dry 1.25 tonnes of sunflower from about 30% moisture content down to a safe storage level of 10%. This shows that one may dry about 2.5 tonnes sunflower in one day (8 hours). The cost of drying sunflower is about Rs 1.25/kg with this machine. In future, this dryer will be field evaluated for drying, maize and groundnut.

Key Reference

Ahmad, M., and A. A. Mirani (submitted). Development and performance evaluation of a mobile flat-bed dryer for sunflower. International Agricultural Engineering Journal, USA.

Fertilizer Band Placement Drill for Wheat

Introduction

In Pakistan, phosphate fertilizer in wheat is conventionally applied by broadcast method before sowing crop. This is a wasteful method of fertilizer application as only 15-25% of the applied phosphate is utilized by wheat crop. The seed-cum-fertilizer drills currently used in Pakistan place fertilizer either too far from the seed or in direct contact with it. In the former case, fertilizer use efficiency is hampered and in the latter situation, relatively high rate of ammoniated phosphate fertilizer (like DAP) affects the seed germination and crop yield.

Technology Development, Development and Demonstration

To solve above mentioned problems, a fertilizer band placement drill was developed at Farm Machinery Institute, NARC, Islamabad. The drill was field tested and evaluated during 2003 wheat sowing season. This drill places fertilizer 5 cm away

and 5 cm deeper than the seed. The crop roots utilize fertilizer thus applied very effectively, as 60-70% of the applied phosphate is utilized by wheat crop. Field experiments have confirmed that this drill saves 50% phosphate fertilizer compared with broadcast method. In addition, about 10% more grain yield was obtained in plots where 50% fertilizer doze (40 kg DAP/acre) was band placed using this drill than where full recommended phosphate doze (80 kg DAP/acre) was applied through broadcast.

An economic comparison of fertilizer band placement technology and the currently recommended broadcast method of fertilizer application revealed that farmer can get a benefit of Rs 3252/ha by adopting fertilizer band placement technology for wheat. PARC has already signed agreements with two local manufacturers for production of this drill on commercial scale.

Key Reference

Ahmad, M., A. Rashid, and A. A. Mirani. (2004). Development and evaluation of fertilizer band placement drill for wheat. Journal of Engineering and Applied Sciences. Vol. 23(1): 41-49.

Solar-cum-Gas Fired Fruit Dryer

Introduction

Pakistan is producing about 6 million tonnes of fresh fruit annually. This commodity is highly perishable in nature as it has an inherent tendency to spoilage due to physiological reasons, disease and pest infestation. Due to non-availability of post-harvest preservation technologies, about 30% of this produce is wasted from orchard gate till it reaches the consumer. The financial implications of post-harvest losses in fruit by applying percentage losses on their market value were estimated to be about Rs 5.0 billion per annum. To extend the storage (shelf) life of perishable fruit, and to increase their commercial value, an innovative drying technology was needed by the farmers.

Technology Development, Development and Demonstration

To address this issue, Farm Machinery Institute, NARC, Islamabad has designed and developed a solar-cum-gas fired fruit dryer. This consists of eight flat-plate solar collectors, an axial flow fan, a drying chamber and a supplementary source of heating

i.e. gas. Initially, the performance of this dryer was evaluated at Nalkot, Swat, where the persimmon were dried using this dryer. The solar dryer was capable to process about 1 to 1.5 tonnes of fresh persimmon in a month. Later, the gas firing system was added to increase the drying capacity of this dryer. A unit of solar-cum-gas fired dryer was installed and evaluated at Dhaki, D.I. Khan in August 2003. Experimental results indicate that the dryer is capable to dry about 544 kg of fresh dates within 5 days. The seasonal drying capacity of the dryer was predicted about 4 tonns. The economic analysis revealed that one may earn Rs 72,100/- per season by using the solar-cum-gas fired dates dryer. It is a small scale on-farm dates drying technology, and is well suited to produce quality dried fruit in order to present them into international market. PARC has signed an agreement with a local manufacturer to commercialize this technology at large scale.

Key References

Ahmad, M., and A. S. Khan. (1997). Design and construction of a solar grain and fruit drying system. Agricultural Mechanization in Asia, Africa, and Latin America Vol. 28(4): 62-66, Tokyo, Japan.

Ahmad, M. (2001). Performance of solar fruit drying system. Journal of Engineering and Applied Sciences. Vol. 20(2): 45-52.

Seeder for Wheat and Rice

Introduction

Wheat and rice crops are grown in Pakistan over an area of about 8.2 and 2.5 mha, respectively. Area under Rice-Wheat cropping system during 2004-2005 was around 1.7 mha. Basmati rice varieties cover more than 55 percent of the area, which mature late. This results in decreasing the turnaround time between the two crops and eventually wheat sowing gets delayed.

Mostly European self-propelled combine harvesters are imported in the country. It is estimated that about 4000 units of such combines are in operation, and more than 50 percent of rice crop is harvested using these combines especially in Punjab Province. These machines cut paddy crop at the height of 40-80 cm and leave behind a swath of loose residue, which clog the openers of existing Zero-till drills. Residue management is a major problem in rice-wheat system of the country. Residue is either removed or spread in the field in order to overcome this problem. However, farmers prefer to burn it as an easy method of land clearance for subsequent crop. Burning of residue not only results in loss of potential nutrients to the soil but also poses a great threat to the natural environment, human health and economic loss

when smog restricts road and air traffic. Residue appears to be the only organic matter available to most rice farmers. Incorporation of crop residue into the soil enhances soil fertility through supplementing soil nutrients. Burning of rice residue causes almost complete loss of Nitrogen 25%, Phosphorus 20%, Potassium and Sulphur 5-60%. The engineers of Pakistan Agricultural Research Council (PARC) Islamabad are working on this issue and have developed a machine namely FMI Seeder.

Technology Development, Development and Demonstration

This machine at first cuts the stubbles as well as picks up the loose straw lying in front of each opener of the Zero Till Drill and chops them into small pieces and spreads uniformly over the seeded rows in a single operation. It is a PTO driven tractor mounted for an eight-row machine and is suitable for the majority of tractors available in the country. Its effective field capacity is around one acre an hour. Efficient use of FMI Seeder will result in timely sowing of wheat substantial savings in its operating cost soil moisture conservation early decomposition of crop residue non- chemical weed control reduced environmental pollution; and, improvement in soil aeration and fertility.

Key References

Kalwar S. A, N. Amjad, H. S. Mahmood, J. Blackwell, and E. Humphreys. (2006). The FMI Seeder and its performance. Paper presented at workshop on permanent bed rice –wheat cropping systems & direct drilling into rice residues in the north west indo-gangetic plains from sep.3-7,2006 held at Punjab Agricultural university Ludhiana, India

Mobile Seed Processing Unit

Introduction

Quality seed is essential for profitable crop production. Crop production can be increased by 10-20% by using seed, which is viable, free from weeds seed and diseases. Currently, 16% of wheat seed, 18% of paddy seed, 8% of pulses seed and 11% of vegetables seed is available that is certified. The rest of the demand is met through traditional sources. One of the constraints in providing healthy seed to growers is the unavailability of small-scale seed processing technology. To meet the acceptable standards, the undesirable materials must be removed from the crop seed, which is possible by providing a small-scale seed-processing unit to the seed growers and seed companies.

Technology Development, Demonstration and Commercialization

To address this problem, Farm Machinery Institute, NARC Islamabad has designed and developed a Mobile Seed Processing Unit. Research work on prototype was started in April 2002 at FMI Aspirator and grader were developed in 2003 and were tested at farmers' fields in Bhakkar, Kala Shah Kaku, Sargodha, and Punjab Seed Corporation, Gujranwala in 2003, 2004, and 2005 on wheat, paddy and pulses seeds. Length separating unit (indent cylinder) was developed in 2006 with the collaboration of a local manufacturer. The Seed Processing Unit was demonstrated in Rahim Yar Khan and Multan to farmers and seed companies in 2006. This unit is suitable for progressive seed growers and seed companies to process their produce effectively. A local manufacturer has started manufacturing and marketing Mobile Seed Processing Unit.

The Technology

The FMI designed multi-crop Mobile Seed Processing Unit removes inert material, weeds, broken grains, and shriveled grains from healthy grains. It also grades seeds into three categories: healthy seeds, light seeds, broken and shriveled seeds. It can be moved from one place to another. It is suitable for processing wheat, paddy, pulses, sunflower, peas, and okra. Its capacity ranges from 1 to 1.5 tonnes per hour for different crops. Its operating cost is Rs. 400 per tonn and saves Rs. 2600 per tonn as compared to traditional cleaning methods.

Key References

Ahmad, T. (2005). Development and Commercialization of Mobile Seed Processing Unit. Paper presented at National Seminar on Seed Processing Machinery in Pakistan, April 18, 2005 at NARC, Islamabad.

Ahmad, T., Kalwar, S. A., Munir, A. and Amjad, N. (2006). Mechanization Technologies for Wheat Planting and Seed Processing. Paper presented at seminar on Wheat Production Technology, September 18, 2006 at Ayub Agricultural Research Institute, Faisalabad.

Pneumatic Row Crop Planter

Introduction

Although sunflower as oil seed crop was introduced in the country about forty years back but it could not expand due to some technological and market problems. Amongst the technological issues, the planting of crop was the main problem. Traditionally, farmers were sowing this crop by broadcasting the seed that was not so efficient method of crop sowing.

Not only higher seed rate (3kg/acre) was required but also some post sowing problems like less seed germination ratio, difficulty in weeding, non-uniform flower maturity and less crop yield were coupled with this traditional sowing method.

Technology, Development, Demonstration and Recommendation

Farm Machinery Institute in collaboration with National Oilseed Development Project (NODP), Pakistan Agricultural Research Council developed a tractor PTO driven pneumatic row crop planter. The machine handles seed very gently using air suction through holes of a rotating disc. The hole numbers and size are according to the seed type and size. It is quite capable to plant a wide range of seeds like maize, sunflower and tomato at a uniform spacing. It has a provision to adjust number of seeds per hill, hill spacing, seed planting depth and fertilizer banding. It is locally available in four and six rows depending on the size of the tractor.

The Technology

The pneumatic row crop planter is cost effective as it results in uniform stand established, convenient for weed eradiation

Key Reference

Zaidi, M. A., M. A. Tabassum, A. S. Khan, and A. Hassan, 1998. Development of Pneumatic Row Crop Planter in Pakistan. Journal of Agricultural Mechanization in Asia (AMA), Japan, 29(1): 13-16.

Modified Maize Sheller

Introduction

Post harvest losses reduce the production in maize particularly due to manual shelling Previously, the farmers used to shell maize ears by manual beating which resulted in breakage. Then large shellers operated by tractors were imported and used by some farmers on rental basis. The rent of these shellers was very high and its availability to the farmers renamed low.

The NARC Maize Programme, in collaboration with CIMMYT and Farm Machinery Institute of NARC, designed a maize sheller, which can be operated by electricity as well as manually. These shellers are cheaper, easy to handle.

Impact

These shellers are now very common in use and private sector is involved in the manufacture of these units.