A harvesting machine for cutting and collecting soft leaf produce in beds consisting of, at least, one row of produce including a frame (5) of generally open structure, said frame (5) having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate (9) mounted on said front end of said frame, said backing plate (9) having at least two elongate members (10) extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means (12) mounted thereon extending between said elongate members (10) adapted to provide a cutting action substantially perpendicular to travel of said frame (5) over said row of produce.
FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Albania</td>
<td>ES</td>
<td>Spain</td>
<td>LS</td>
<td>Lesotho</td>
</tr>
<tr>
<td>AM</td>
<td>Armenia</td>
<td>FI</td>
<td>Finland</td>
<td>LT</td>
<td>Lithuania</td>
</tr>
<tr>
<td>AT</td>
<td>Austria</td>
<td>FR</td>
<td>France</td>
<td>LU</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>AU</td>
<td>Australia</td>
<td>GA</td>
<td>Gabon</td>
<td>LV</td>
<td>Latvia</td>
</tr>
<tr>
<td>AZ</td>
<td>Azerbaijan</td>
<td>GB</td>
<td>United Kingdom</td>
<td>MC</td>
<td>Monaco</td>
</tr>
<tr>
<td>BA</td>
<td>Bosnia and Herzegovina</td>
<td>GE</td>
<td>Georgia</td>
<td>MD</td>
<td>Republic of Moldova</td>
</tr>
<tr>
<td>BB</td>
<td>Barbados</td>
<td>GH</td>
<td>Ghana</td>
<td>MG</td>
<td>Madagascar</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
<td>GN</td>
<td>Guinea</td>
<td>MK</td>
<td>The former Yugoslavia</td>
</tr>
<tr>
<td>BF</td>
<td>Burkina Faso</td>
<td>GR</td>
<td>Greece</td>
<td>ML</td>
<td>Mali</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
<td>HU</td>
<td>Hungary</td>
<td>MN</td>
<td>Mongolia</td>
</tr>
<tr>
<td>BJ</td>
<td>Benin</td>
<td>IE</td>
<td>Ireland</td>
<td>MR</td>
<td>Mauritania</td>
</tr>
<tr>
<td>BR</td>
<td>Brazil</td>
<td>IL</td>
<td>Israel</td>
<td>MW</td>
<td>Malawi</td>
</tr>
<tr>
<td>BY</td>
<td>Belarus</td>
<td>IS</td>
<td>Iceland</td>
<td>MX</td>
<td>Mexico</td>
</tr>
<tr>
<td>CA</td>
<td>Canada</td>
<td>IT</td>
<td>Italy</td>
<td>NE</td>
<td>Niger</td>
</tr>
<tr>
<td>CF</td>
<td>Central African Republic</td>
<td>JP</td>
<td>Japan</td>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>CG</td>
<td>Congo</td>
<td>KE</td>
<td>Kenya</td>
<td>NO</td>
<td>Norway</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
<td>KG</td>
<td>Kyrgyzstan</td>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>CI</td>
<td>Côte d'Ivoire</td>
<td>KP</td>
<td>Democratic People's</td>
<td>PH</td>
<td>Poland</td>
</tr>
<tr>
<td>CM</td>
<td>Cameroon</td>
<td>KR</td>
<td>Republic of Korea</td>
<td>PT</td>
<td>Portugal</td>
</tr>
<tr>
<td>CN</td>
<td>China</td>
<td>KZ</td>
<td>Kazakhstan</td>
<td>RO</td>
<td>Romania</td>
</tr>
<tr>
<td>CU</td>
<td>Cuba</td>
<td>LC</td>
<td>Saint Lucia</td>
<td>RU</td>
<td>Russian Federation</td>
</tr>
<tr>
<td>CZ</td>
<td>Czech Republic</td>
<td>LI</td>
<td>Liechtenstein</td>
<td>SD</td>
<td>Sudan</td>
</tr>
<tr>
<td>DE</td>
<td>Germany</td>
<td>LK</td>
<td>Sri Lanka</td>
<td>SE</td>
<td>Sweden</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
<td>LR</td>
<td>Liberia</td>
<td>SG</td>
<td>Singapore</td>
</tr>
<tr>
<td>EE</td>
<td>Estonia</td>
<td></td>
<td></td>
<td>SI</td>
<td>Slovenia</td>
</tr>
<tr>
<td>SK</td>
<td>Slovakia</td>
<td>SN</td>
<td>Senegal</td>
<td>SZ</td>
<td>Swaziland</td>
</tr>
<tr>
<td>TD</td>
<td>Chad</td>
<td>TG</td>
<td>Togo</td>
<td>TJ</td>
<td>Tajikistan</td>
</tr>
<tr>
<td>TM</td>
<td>Turkmenistan</td>
<td>TR</td>
<td>Turkey</td>
<td>TT</td>
<td>Trinidad and Tobago</td>
</tr>
<tr>
<td>UA</td>
<td>Ukraine</td>
<td>UG</td>
<td>Uganda</td>
<td>US</td>
<td>United States of America</td>
</tr>
<tr>
<td>UZ</td>
<td>Uzbekistan</td>
<td>VN</td>
<td>Viet Nam</td>
<td>YU</td>
<td>Yugoslavia</td>
</tr>
<tr>
<td>ZW</td>
<td>Zimbabwe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIELD OF THE INVENTION

The invention relates to harvesting machinery for cutting, conveying and packaging crops in commercial fields. In particular the invention relates to harvesting machinery which closely simulates manual cutting so as to enable handling and cutting of soft leaf produce without substantially damaging the produce.
BACKGROUND OF THE INVENTION

There are presently many types of broad leaf crops grown which need to be handled very delicately. In particular soft leaf crops may be readily bruised and spoilt if not handled with extreme care. Such soft leaf crops are typically cut by hand with a knife or machete or sickle. Manual harvesting however suffers the drawback of being extremely labour intensive and the action of bunching leaves together for cutting is sufficient action to bruise such produce and significantly reduce shelf-life. There has been some attempts to address these problems by developing machinery designed to essentially reduce the labour involved and costs associated therewith.

Automated devices designed to address these problems are still typically far too abrasive and readily bruise row crops and in particular soft leaf crops. Many prior art harvesting machines have been able to at least in part address the need for reduction in labour costs. However there still remains a need to provide a device which practically addresses both labour intensity and crop damage. Prior art devices have included among other things a reciprocating cutting action which tends to tear or bruise outer leaves on soft leaf produce. The type of damage or bruising occurring cannot be reversed and adversely affects the appearance of the produce and produce shelf-life. In addition scissor type cutting action produced by reciprocating blade cutting action tends to jam frequently as a result of dirt or stones being wedged between adjacent cutting blades.

It is the intention of this invention to address these disadvantages.

The present invention seeks to ameliorate at least one of the disadvantages of the prior art by providing a device which significantly reduces labour costs and substantially eliminates bruising or damage of soft leaf produce.

SUMMARY OF THE INVENTION

There has been a long felt need in harvesting of soft leaf produce to provide a device which will enable efficient cutting of such crops while substantially eliminating damage or bruising thereto.
Thus the present invention provides in a first aspect:-

a harvesting machine for cutting and collecting soft leaf produce in beds consisting of at least one row of produce including a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce.

In a second aspect of the invention there is described a method of cutting and collecting soft leaf produce in beds consisting of at least one row of produce by providing:-

a harvesting machine including:-

a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said produce in said at least one row of said bed, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce,

moving said frame over said bed wherein said space between said elongate members receives said produce in said at least one row, said elongate members engaging said produce and folding external broad leaf inwardly so as to expose base stalk for cutting, and cutting said base stalk of said produce with said cutting means.
PREFERRED ASPECTS OF THE INVENTION

Preferably the harvesting machine further includes a conveyor means for conveying cut produce from the front of said structure to the rear for packaging.

Preferably the conveyor is mounted on said frame extending from said front to rear end of said structure in an inclined relationship being lower at said front end for receiving produce severed by said cutting means.

Preferably the conveyor is inclined at an angle of between 0 and 45°.

Preferably the frame structure includes a coupling means adapted for coupling to a vehicle such as a tractor so as to promote travel over said bed of produce, alternatively the harvesting machine is adapted to be self propelled by means of a motor attached thereto.

Preferably the coupling means is attached to the open frame structure either at the front end, underneath or at the rear end or even on one side of said open frame structure.

In any case the open frame structure can be adapted, by way of coupling means, to be pushed or pulled in a direction along a plantation bed.

Preferably the cutting means provides an oscillating cutting action in a direction substantially perpendicular to said direction of travel.

Preferably the cutting means comprises a plurality of cojoined cutting edges forming a single continuous edge extending forwardly from beneath said backing plate of engagement means and between said plurality of elongate members.

Preferably the cutting means can comprise a plurality of knives attached end to end forming a continuous single cutting edge.

Preferably the cutting means can be a single continuous edge.
Preferably the cutting means can be a single rotating disc.

Preferably the cutting means can be a pair of counterrotating discs, more preferably for each row of crops there can be a corresponding pair of counterrotating discs placed between respective guides.

Preferably the cutting blade can be circular, horizontal or disc shaped depending on the type of crop to be harvested.

Preferably the cutting means is provided with oscillating movement. In particular when the cutting means is a series of edges cojoined to form a continuous edge or is a single continuous edge, oscillating cutting movement is preferred.

Preferably the cutting means is attached to a drive shaft which oscillates said cutting edges, or said continuous edge.

Preferably the cutting edges contain a plurality of serrations or can be a straight edge. The type of cutting edge is largely dependant on the type of crop being harvested, for example crops with high fibre would need to be cut with a serrated edge.

Preferably the cutting means can be adjusted in terms of height and depth of cutting.

Typically the width or size of the vegetable produce determines the preset depth of cutting blades. The height adjustment of the cutting blade provided by the present invention enables substantial regrowth whereas prior art harvesters will invariably crush harvested produce.

Preferably said backing plate includes a series of elongate members evenly spaced apart extending forwardly therefrom for receiving therein one row of produce in a given bed. It is understood that for example where there are \( n \) rows of crops in a given bed there will be \( n + 1 \) elongate members.

Preferably the elongate members are wedge shaped extending broadly and forwardly
from said backing plate to form a point at a distance from said backing plate. In use the points serve as guides which move between adjacent rows of crops. As stated previously, the area between each elongate member is used to receive a single row of crops.

5 Preferably the elongate members further include a centrally located longitudinal upstanding portion for enabling closure of external leaf of said produce when produce is received between said elongate members so as to expose base stalk of said produce for cutting.

10 Preferably the backing plate can be raised or lowered.

Preferably the harvesting machine further includes a soft rotatable brush mounted adjacent said front end for urging cut produce onto said conveyor.

15 Preferably the harvesting machine has a packing platform adjacent the rear of said frame for holding packaging containers which in turn receive cut produce transferred to said rear end by said conveyor.

It is generally understood that in the method of the invention when produce is received between adjacent elongate members and exposed for cutting, the forward motion of the harvesting machine will necessarily enable cut produce to be captured on the conveyor as it falls. Once on the conveyor the cut produce is immediately transferred to the rear end of said frame for packaging.

20 The applicants have found that the harvesting machine significantly reduces labour costs and effectively cuts produce without causing bruising of soft leaf normally associated with prior art machine harvesting.

25 Preferably the open frame structure can be of any desired length and width.

30 Preferably the frame structure is supported on more than two wheels.

Preferably the wheels are adjustably mounted on an axle adjacent the rear end to adapt
to changes in terrain.

Preferably the wheels can be adjusted manually or by hydraulics or by sensors attached to the open frame structure.

In the present invention there is also disclosed in a third aspect of the invention a method of cutting and collecting soft leaf produce in beds consisting of at least one row of produce by providing:

a harvesting machine including:

a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced to remove ovaries of said elongate members apart, said space between said members defining an area for receiving said produce in said at least one row of said bed, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce,

and a conveyor means for transferring produce cut by said cutting means,

moving said frame over said bed wherein said space between said elongate members receives said produce in said at least one row, said elongate members engaging said produce and folding external broad leaf inwardly so as to expose base stalk for cutting, and cutting said base stalk of said produce with said cutting means, such that movement of said frame over said bed enables said cut produce to fall on said conveyor for transfer of said cut produce to said rear of said frame for packaging or collection.

In a fourth aspect of the invention there is disclosed a harvesting machine for cutting and collecting soft leaf produce in beds consisting of at least one row of produce including a frame or chassis of generally open structure, said frame having a front and rear end and
being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce,

and a conveyor means for transferring produce cut by said cutting means from said front to rear of said frame for collection.

Specific embodiments of the invention will now be described by way of non-limiting example.

15 BRIEF DESCRIPTIONS OF THE VIEWS OF THE DRAWINGS

Figure 1 is a perspective view from the front of the harvester apparatus of the invention.

Figure 2 is a part front view of the harvester apparatus of the invention in unassembled relation.

Figure 3 is an exploded view of the drive mechanism of the harvester apparatus.

INTEGER LIST

25

5. Open frame (chassis)
6. Front end
7. Rear end
9. Backing plate
10. Elongate members
11. Centrally located member
12. Cutting means
13. Oscillating drive mechanism
14. Conveyor means
15. First end
16. Second end
17. Wheels
18. Coupling means
19. Conveyor drive mechanism
20. Platform means
21. Rollers bars
22. Point of elongate members
23. Rotating brush
24. PTO shaft
25. Gear box
26. Axle
27. Locking pins
28. Bearing surfaces

The applicants have found not only does the harvester of the invention significantly reduce labour costs associated with manual cutting, but primarily it simulates the type of cutting method normally only expected or experienced from hand cutting without the need to handle produce directly. In this way bruising is substantially eliminated and the shelf-life and appearance significantly improved.

The harvester essentially enables a row of crops to be lifted slightly to expose the stalk and folds outside leaves of a crop inwards so as to substantially avoid bruising or damage of leaf which such produce would otherwise be exposed to.

**DETAILED DESCRIPTION WITH RESPECT TO THE DRAWINGS**

Referring to the drawings there is shown a representation of an assembled harvester apparatus of the invention comprising an open frame structure (5) which frame has a front end (6) and a rear end (7).

Supporting wheels (17) are attached to an axle (26) located adjacent the rear end (7) of
the open frame which can be releasably raised or lowered. An inclined conveyor means (14) is mounted on the open frame (5) having a first lower end (15) mounted on the front end (6) relative to a second higher end (16) attached to said rear end (7) of the open frame. The conveyor therefore adopts an elevated position.

The open frame structure or chassis further includes a coupling means (18) in unassembled form mounted on the front end (6) of open frame (5) which is adapted to be connectable to a moving vehicle such as a tractor or the like. The coupling means has an A-type configuration adapted to be readily connectable to conventional tractor machinery. The coupling means includes locking pins (27) which enable the A-type configured coupling means to swivel on bearing surfaces (28) so as to substantially maintain a constant cutting level independent of terrain. In an alternate embodiment the open frame structure has an engine mounted thereon so that the harvesting machine can be self propelled.

The coupling means can also be adapted to provide attachment to a tractor from underneath, from the side or indeed from the rear. Therefore the apparatus can be towed or pushed or even driven from one side.

There is shown in Figure 1 a power take off (PTO) shaft (25) mounted on the front end (6) of the open frame (5) attached to a gear box (26) located immediately therebehind. The PTO shaft has a spline for engagement with a universal joint which is in turn joined to a conventional tractor component (not shown) so as to turn the PTO shaft. In an alternative embodiment the PTO can be rotated by a hydraulic oil pump. This would be the preferred mode of operating the PTO particularly if the PTO was to be configured underneath the open frame structure.

In the embodiment referred to in Figure 1 there is also shown a mechanical operating means (19) for rotating first and second ends of the conveyor means enabling the conveyor means to move about said first and second ends. In Figures 2 and 5 there is shown attached to the rear end (7) of the open frame (5) a platform means (20) adapted to hold thereon containers for packaging harvested crops. The platform means also includes a plurality of roller bars (21) so that containers held thereon can be readily
moved.

In Figures 1 and 2 there is shown a close-up view of a backing plate (9) mounted on the front end of open frame (5) immediately forward of said first end of the conveyor means. The backing plate (9) has a plurality of elongate members (10) spaced evenly apart and extending forwardly from said backing plate. The spaces between said plurality of elongate members define areas within which crops may be held in engaged relation to the cutting means (12). The elongate members are wedge shaped and taper inwardly so that the furthest end extending from the backing plate form a point (23). These points (23) serve as guides for substantially maintaining tracking movement between rows of crops. The space between adjacent points therefore define areas within which rows of crops can be engaged for cutting. The elongate members contain centrally located members (11) which serve to provide structural reinforcement for elongate members and which help fold outer leaves of produce so as to expose base stalk for cutting.

It is to be understood that when the harvesting machine is urged over a bed containing rows of produce, the backing plate (8) is lowered so that the points (21) move between adjacent rows. As the harvesting machine moves toward produce, the produce is captured within space defined by adjacent elongate members (9). The centrally located members (10) cause outer leaves of produce to fold inwards so as to expose produce stem for cutting. The cutting blade (11) subsequently severs the stalk and the cut produce is received on the conveyor (13). The rotating brush (22) helps cut produce onto said conveyor. Once on the conveyor the produce is moved to the rear end (7) of the chassis for packaging. The platform (19) may retain containers for packaging thereon and the containers may be readily removed from the platform (19) by means of sliding across rollers (20).

In Figures 1 and 2 there is also shown cutting means (12) extending forwardly and between said backing plate (9). In use the cutting means provides cutting motion which is substantially perpendicular to the direction of movement along a row of crops. The type of blade used for cutting will largely be determined by the type of crop being harvested. For example a crop with a fibrous leaf and stalk would be best cut with a serrated edge, while a very soft leaf produce such as spinach may be better suited to a
straight edge blade.

In Figures 2 and 3 the cutting means (12) is shown connected to an oscillating drive mechanism (13) which drives oscillating motion of the cutting means so as to closely simulate a manual sawing or cutting action. It is understood that the cutting means can be adjusted in height and depth. It has been shown by the applicant that substantial regrowth of crops can occur after harvesting with this apparatus has been complete. For example, applicants have shown significant crop regrowth where a heart portion of a crop remains intact after leaves have been harvested. Prior art harvesters generally do not have the ability to enable regrowth of this nature. Generally in a prior art apparatus, harvesting of soft leaf produce will result in absolute devastation of the crop remaining in the ground, thus substantially eliminating regrowth. The rate of harvesting has also been found by the applicant to be significantly increased without bruising produce and hence labour costs are reduced in comparison to conventional harvesting.

Figures 1 and 2 also show an example of a rotating brush (24) which is adapted to be mounted on the front end (6) of open frame (5) immediately above the first end (15) of the conveyor means (14). The rotating brush rotates in combination with the direction of movement of the conveyor means so as to help urge cut produce onto said conveyor means.

Ordinarily during crop harvesting the forward linear momentum of the harvesting apparatus is sufficient to propel produce backwards onto the conveyor means after cutting.

Once on the conveyor means, cut produce is transferred to the rear end of the open frame to be packed.

The claims, illustrations, photographs and drawings, if any, form part of the disclosure of this specification as does the description, claims, illustrations, photographs and drawings of any associated provisional or parent specification or of any priority document, if any, all of which are imported hereinto as part of the record hereof.
Finally it is to be understood that various alterations, modifications and/or additions may be incorporated into the various constructions and arrangements or parts without departing from the spirit and ambit of the invention.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A harvesting machine for cutting and collecting soft leaf produce in beds consisting of at least one row of produce including a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce.

2. A harvesting machine according to Claim 1 wherein said machine further includes a conveyor means for conveying cut produce from the front of said structure to the rear for packaging.

3. A harvesting machine according to Claim 2 wherein the conveyor is mounted on said frame extending from said front to rear end of said structure in an inclined relationship being lower at said front end for receiving produce severed by said cutting means.

4. A harvesting machine according to Claim 3 wherein the conveyor is inclined at an angle between 0 and 45°.

5. A harvesting machine according to any one of the preceding claims wherein the frame structure includes a coupling means adapted for coupling to a vehicle such as a tractor so as to promote travel over said bed of produce.

6. A harvesting machine according to Claim 5 wherein the coupling means is attached to the open frame structure either at the front end, underneath or at the rear end or even on one side of said open frame structure.
7. A harvesting machine according to any one of the preceding claims wherein the cutting means provides an oscillating cutting action in a direction substantially perpendicular to said direction of travel.

8. A harvesting machine according to any one of the preceding claims wherein the cutting means includes a plurality of cojoined cutting edges forming a single continuous edge extending forwardly from beneath said backing plate of engagement means and between said plurality of elongate members.

9. A harvesting machine according to any one of the preceding claims wherein the cutting means comprises a plurality of knives attached end to end forming a continuous single cutting edge, alternatively the cutting means is a single blade extending across the front end of said structure.

10. A harvesting machine according to any one of the preceding claims wherein the cutting means comprises a plurality of knives attached end to end forming a single rotating disc.

11. A harvesting machine according to any one of the preceding claims wherein the cutting means comprises a plurality of knives attached end to end forming a pair of counterrotating discs.

12. A harvesting machine according to any one of the preceding claims wherein the backing plate includes a series of elongate members evenly spaced apart extending forwardly therefrom for receiving therein one row of produce in a given bed.

13. A harvesting machine according to Claim 12 wherein the elongate members are wedge shaped extending broadly and forwardly from said backing plate to form a point at a distance from said backing plate. In use the points serve as guides which move between adjacent rows of crops. As stated previously, the area between each elongate member is used to receive a single row of crops.
14. A harvesting machine according to Claim 13 wherein the points serve as guides which move between adjacent rows of crops.

15. A harvesting machine according to any one of the preceding claims wherein the elongate members further include a centrally located longitudinal upstanding portion for enabling closure of external leaf of said produce when produce is received between said elongate members so as to expose base stalk of said produce for cutting.

16. A harvesting machine according to any one of the preceding claims wherein the backing plate can be raised or lowered.

17. A harvesting machine according to any one of the preceding claims wherein the harvesting machine further includes a soft rotatable brush mounted adjacent said front end for urging cut produce onto said conveyor.

18. A harvesting machine according to any one of the preceding claims further including a packing platform adjacent the rear of said frame for holding packaging containers which in turn receive cut produce transferred to said rear end by said conveyor.

19. A harvesting machine according to any one of the preceding claims wherein the open frame structure or chassis can be of any desired length and width so as to cater for any particular bed width.

20. A harvesting machine according to Claim 19 wherein said open frame structure is supported and moveable over said bed of produce on more than two wheels.

21. A harvesting machine according to Claim 20 wherein the wheels are adjustably mounted on an axle adjacent the rear end to adapt to changes in terrain.

22. A harvesting machine according to Claim 21 wherein the wheels can be adjusted manually or by hydraulics or by sensors attached to the open frame structure.
23. A method of cutting and collecting soft leaf produce in beds consisting of at least one row of produce by providing:-

5 a harvesting machine including:-

a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said produce in said at least one row of said bed, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce,

15 moving said frame over said bed wherein said space between said elongate members receives said produce in said at least one row, said elongate members engaging said produce and folding external broad leaf inwards so as to expose base stalk for cutting, and cutting said base stalk of said produce with said cutting means.

24. A method of cutting and collecting soft leaf produce in beds consisting of at least one row of produce by providing:-

25 a harvesting machine including:-

a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced to remove ovaries of said elongate members apart, said space between said members defining an area for receiving said produce in said at least
one row of said bed, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce,

and a conveyor means for transferring produce cut by said cutting means, moving said frame over said bed wherein said space between said elongate members receives said produce in said at least one row, said elongate members engaging said produce and folding external broad leaf inwardly so as to expose base stalk for cutting, and cutting said base stalk of said produce with said cutting means, such that movement of said frame over said bed enables said cut produce to fall on said conveyor for transfer of said cut produce to said rear of said frame for packaging or collection.

25. A harvesting machine for cutting and collecting soft leaf produce in beds consisting of at least one row of produce including a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, said frame further including a backing plate mounted on said front end of said frame, said backing plate having at least two elongate members extending forwardly therefrom spaced apart, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said row of produce,

and a conveyor means for transferring produce cut by said cutting means from said front to rear of said frame for collection.

26. A harvesting machine substantially as hereinbefore described with reference to the diagrams.
1. A harvesting machine for cutting and collecting soft leaf produce in beds consisting of at least one row of produce including a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over said bed of produce, a conveyor mounted on said frame extending from the front to the rear end of said frame in an inclined relation being lower at the front, said frame further including a backing plate mounted on said front end of said frame extending at an obtuse angle to the inclined conveyor in a horizontal plane, said backing plate having a series of wedge shaped elongate members extending in equally spaced apart relation and forwardly therefrom in the same plane as the backing plate to form points furthest from the backing plate, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said at least one row of produce, wherein external leaves of said produce are folded inwardly to form a bunch and said bunch is cut leaving behind a heart portion of said produce so as to promote substantial regrowth of said heart portion.

2. A harvesting machine according to Claim 1 wherein the points serve as guides which move between adjacent rows of crops.

3. A harvesting machine according to any one of the preceding claims wherein the elongate members further include a centrally located longitudinal vertically disposed portion for enabling closure of external leaf to form a bunch of said produce prior to cutting so that a bunched portion of the produce is exposed for cutting, leaving intact produce so as to promote regrowth thereof.

4. A harvesting machine according to Claim 1 wherein the conveyor is inclined at an angle between 0 and 45°.

5. A harvesting machine according to any one of the preceding claims wherein the
frame structure includes a coupling means adapted for coupling to a vehicle such as a tractor so as to promote travel over said bed of produce.

6. A harvesting machine according to Claim 5 wherein the coupling means is attached to the open frame structure either at the front end, underneath or at the rear end or even on one side of said open frame structure.

7. A harvesting machine according to any one of the preceding claims wherein the cutting means provides an oscillating cutting action in a direction substantially perpendicular to said direction of travel.

8. A harvesting machine according to any one of the preceding claims wherein the cutting means includes a plurality of conjoined cutting edges forming a single continuous edge extending forwardly from beneath said backing plate of engagement means and between said plurality of elongate members.

9. A harvesting machine according to any one of the preceding claims wherein the cutting means comprises a plurality of knives attached end to end forming a continuous single cutting edge, alternatively the cutting means is a single blade extending across the front end of said structure.

10. A harvesting machine according to any one of the preceding claims wherein the cutting means comprises a plurality of knives attached end to end forming a single rotating disc.

11. A harvesting machine according to any one of the preceding claims wherein the cutting means comprises a plurality of knives attached end to end forming a pair of counterrotating discs.

12. A harvesting machine according to any one of the preceding claims wherein the backing plate can be raised or lowered.

13. A harvesting machine according to any one of the preceding claims wherein the
harvesting machine further includes a soft rotatable brush mounted adjacent said front end for urging cut produce onto said conveyor.

14. A harvesting machine according to any one of the preceding claims further including a packing platform adjacent the rear of said frame for holding packaging containers which in turn receive cut produce transferred to said rear end by said conveyor.

15. A harvesting machine according to any one of the preceding claims wherein the open frame structure or chassis can be of any desired length and width so as to cater for any particular bed width.

16. A harvesting machine according to Claim 15 wherein said open frame structure is supported and moveable over said bed of produce on more than two wheels.

17. A harvesting machine according to Claim 16 wherein the wheels are adjustably mounted on an axle adjacent the rear end to adapt to changes in terrain.

18. A harvesting machine according to Claim 17 wherein the wheels can be adjusted manually or by hydraulics or by sensors attached to the open frame structure.

19. A method of cutting and collecting soft leaf produce in beds consisting of at least one row of produce by providing: -

a harvesting machine including: -

a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, a conveyor mounted on said frame extending from the front to the rear end of said frame in an inclined relation being lower at the front, said frame further including a backing plate mounted on said front end of said frame extending at an obtuse angle to the inclined conveyor in a horizontal plane, said backing plate having a series of wedge shaped elongate members extending in equally spaced apart
relation and forwardly therefrom in the same plane as the backing plate to form points furthest from the backing plate, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular to travel of said frame over said at least one row of produce,

moving said frame over said bed wherein said space between said elongate members receives said produce in said at least one row, said elongate members engage and fold external broad leaves of said produce inwardly so as to bunch said leaves, and cutting said leaves of said produce with said cutting means, wherein a portion of the produce remains intact to promote substantial regrowth and the harvested leaves fall backwards onto the conveyor and are conveyed by said inclined conveyor from the front to the rear of the machine for packaging.

20. A method of cutting and collecting soft leaf produce in beds consisting of at least one row of produce by providing:-

a harvesting machine including:-

20 a frame or chassis of generally open structure, said frame having a front and rear end and being supported on wheels for travel over a said bed of produce, a conveyor mounted on said frame extending from the front to the rear end of said frame in an inclined relation being lower at the front,

25 said frame further including a backing plate mounted on said front end of said frame extending at an obtuse angle to the inclined conveyor in a horizontal plane, said backing plate having a series of wedge shaped elongate members extending in equally spaced apart relation and forwardly therefrom in the same plane as the backing plate to form points furthest from the backing plate, said space between said members defining an area for receiving said at least one row of produce, said frame further including a cutting means mounted thereon extending between said elongate members adapted to provide a cutting action substantially perpendicular
to travel of said frame over said at least one row of produce,

a rotatable brush positioned adjacent said front end of said conveyor for urging cut leaves onto said conveyor,

moving said frame over said bed wherein said space between said elongate members receives said produce in said at least one row, said elongate members engage and fold external broad leaves of said produce inwardly so as to bunch said leaves, and cutting said leaves of said produce with said cutting means, wherein a portion of the produce remains intact to promote substantial regrowth and the harvested leaves are urged onto said conveyor by said rotatable brush to be conveyed from the front end to the rear end of the machine for packaging.

21. A harvesting machine substantially as hereinbefore described with reference to the diagrams.
## A. CLASSIFICATION OF SUBJECT MATTER

Int CI: A01D 45/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

| IPC         | A01D 45/26, 45/28 |

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>EP 44602 A (BACKUS SORMAC BV) 27 January 1982 Figures</td>
<td>1-26</td>
</tr>
<tr>
<td>X</td>
<td>DE 3135147 A (ORCHARDS RES INST) 24 March 1983 Abstract</td>
<td>1-26</td>
</tr>
<tr>
<td>X</td>
<td>NL 8303714 A (SMIT) 17 May 1985 Abstract</td>
<td>1-26</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C

See patent family annex

* Special categories of cited documents:

- **A** Document defining the general state of the art which is not considered to be of particular relevance
- **E** Earlier application or patent but published on or after the international filing date
- **L** Document which may throw doubts on priority claim(s) of which is cited to establish the publication date of another citation or other special reason (as specified)
- **O** Document referring to an oral disclosure, use, exhibition or other means
- **P** Document published prior to the international filing date but later than the priority date claimed

- **T** Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- **X** Document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- **Y** Document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- **&** Document member of the same patent family

Date of the actual completion of the international search: 15 May 2000

Date of mailing of the international search report: 29 MAY 2000

Name and mailing address of the ISA/AU:

AUSTRALIAN PATENT OFFICE
PO BOX 200
WODEN ACT 2606 AUSTRALIA
E-mail address: pct@ipaaustralia.gov.au
Facsimile No.: (02) 6285 3929

Authorized officer:

PETER WARD
Telephone No.: (02) 6283 2129
<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>NL 8601259 A (Van DEN BEUCKEN) 16 December 1987 Abstract</td>
<td>1-26</td>
</tr>
<tr>
<td>X</td>
<td>EP 502789 A (CENT ETUD &amp; STRATEGIES LTD) 9 September 1992 Abstract</td>
<td>1-26</td>
</tr>
<tr>
<td></td>
<td>Derwent Abstract Accession No: 98-002910/01, Class P12, JP 9-271241 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(SEIREI IND CO LTD) 21 October 1997 Abstract</td>
<td>1-26</td>
</tr>
</tbody>
</table>
This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EP 44602</td>
<td>NL 8004187</td>
</tr>
<tr>
<td>DE 3135147</td>
<td>NONE</td>
</tr>
<tr>
<td>NL 8303714</td>
<td>NONE</td>
</tr>
<tr>
<td>NL 8601259</td>
<td>NONE</td>
</tr>
<tr>
<td>EP 502789</td>
<td>FR 2673505</td>
</tr>
<tr>
<td>JP 9-271241</td>
<td>NONE</td>
</tr>
</tbody>
</table>

END OF ANNEX