

AGRI VISION 2025

1. INTRODUCTION :

Agriculture plays a vital role in the economy of Assam contributing 35% to the State Domestic Product in 1996-97 at constant (1980-81) price. The Government has, therefore, assigned very high priority to agriculture. This was reflected through a quantum jump in rice production to 39 lakh MT in 1999-2000 from the level of 31.55 lakh MT and 33.83 lakh MT in 1998-99 and 1997-98, respectively. This was achieved through creation of assured Shallow Tube Well irrigation with assistance of World Bank (ARIASP) and NABARD (SKY) scheme. Although regular flood, drought, heavy population pressure on land and infrastructural weakness are impediments to growth, yet the farmers have started to increase production through technological innovations and appropriate Government policies. During the next quarter century, the tempo of raising productivity and production must be accelerated along with integration of our economy with outside economies necessitated in the aftermath of liberalization.

In the premises of the above background a VISION PLAN through 2025 A.D. has been proposed keeping food security, employment generation and sustainability of agricultural production in its core. Thus a vision statement for Assam's Agriculture is crafted in the following words.

SUSTAINABLE AGRICULTURE FOR ENOUGH FOOD, EMPLOYMENT AND WEALTH

In order to achieve the above vision, areas of intervention that are to be addressed are discussed in this report. But before going to these, the profile of agricultural production base of the State and current status are presented in a brief manner.

AREAS OF INTERVENTION :

Sustainable agriculture is the key to keep up the level of production in the future. Issues related to this are discussed. Unemployment is another important area that is to be addressed in the agriculture sector. The industrial base of the State being narrow, agriculture sector must absorb the ever-growing labour force in the State. Self-sufficiency of food grains, oilseeds and horticultural products is the greatest necessity of the hour. However, excessive population increase has worsened the food situation. Although it is not discussed specifically in this report, serious efforts are necessary to mitigate the demographic problem. Introduction of large-scale shallow tube well irrigation in the State and future plans have reinforced the confidence of the State to wipe out deficit of rice from the next financial year. In this respect the strategy is to give stress on summer rice production with the irrigation potentiality created under shallow tube well programmes. Introduction of hybrid seeds under summer rice will augment and stabilize rice production. Emphasis on cultivation of scented rice and other varieties suitable for snacks during Sali season holds great promise for exports. A target of production of 10 million tonnes of rice has been fixed in 2007-08 to synchronize with the celebration of 60 years of India's independence. But the weakness of the State in this respect is the absence of a modern seed industry which is to be seriously thought of. Nutrient supply for targetted higher production of crops taking a judicious approach of Integrated Nutrient Management will be a challenging area of research in future. Use of green manure crops, bio-fertilizer and other organic manure to stabilize the agro-system shall be the focus of attention. The position of pulses production is far from satisfactory due to inherent lack of soil potentiality and absence of breakthrough in pulse research even in national level. However, strategies have been given to decrease deficit in pulse requirement. In respect of oil seeds, although the State is deficit, there is scope to mop up the deficit and become surplus. Necessary approaches in this regard are also given. In case of horticulture, the State's position is good. The main thrust here will be value addition inviting participation of the private sector. Floriculture is an entirely new field. The potentiality of floriculture can be tapped to augment export earning and mitigate unemployment for which modern infrastructures are to be built. In order to achieve self-sufficiency, agricultural mechanization is the crying need of the hour. Issues related to mechanization are also discussed. Requirement of inputs and other resources are also presented in this report. Other related issues in respect of infrastructure, training, WTO regime and role of Information Technology in Assam's vision in the next quarter century are also presented.

However, increasing population pressure on land will result in shrinkage of cultivated area. By 2025 AD estimated additional population will be about 178 lakh. This population will require about 2 lakh hectares for habitation alone. There will be huge requirement of food for this additional population. In order to meet this requirement, vertical increase of production will remain a pressing necessity during next 25 years.

2. AGRICULTURAL PRODUCTION BASE :

2.1 DISTRIBUTION AND OWNERSHIP CONCENTRATION OF LAND (ASSET) :

Information provided by the Directorate of Economics and Statistics on the number, area and average size of operational holding in Assam in 1990-1991 paint a grim picture of distribution of land among different size classes of operational holdings, (Economic Survey Assam, 1997-1998). Out of 25.2 lakh operational holdings, covering an area of 32 lakh hectares, marginal holding of one or less than one hectare of land accounted for 60.3 percent of total holdings which was only 19 percent of total operated area. Average size of holding was 1.27 hectare. It shows a skewed distribution pattern of land and asset among the farmers of Assam. The situation aggravates further with passage of time resulting in impoverishment of the farming community as consequence of fragmentation of holdings. However, no published data are available on pattern of concentration of land in holdings of different size classes. If control of assets leads to power and access to educational and income earning opportunities, it calls for speedy land reform to restore self confidence among the marginal farmers of the state.

However, large scale organization of Field Management Committees (FMCs) among farmers of Assam to protect them from economic vulnerability has contributed towards instilling self confidence and enabling them to participate in agricultural development process. There are about 25,000 FMCs in the state now.

2.2 TOTAL AREA AND CLASSIFICATION OF AREA OF ASSAM, 1995-1996 :

a. Total geographical area	78,43,800 Hect.
b. Forest	20,12,319 Hect.
c. Area not available for cultivation	24,55,613 Hect.
d. Net area sown	25,45,000 Hect.
e. Total cropped area	36,94,000 Hect.
f. Area sown more than once	12,15,195 Hect.
g. Cultivable waste land	88,043 Hect.

Out of the above net area sown, 3 to 5 lakh hectares are affected by flood to various degrees annually.

3. PRESENT STATUS OF AGRICULTURE :

3.1 AREA AND PRODUCTION TREND OF RICE, WHEAT, PULSE AND OILSEEDS :

Table – I

Year	Rice			Wheat		
	Area	Production	Yield/ha.	Area	Production	Yield/ha.
1951-52	15.47	13.98	919	0.018	0.016	896
1960-61	17.16	16.33	968	0.036	0.030	824
1970-71	19.74	19.86	1022	0.200	0.110	583
1980-81	22.28	24.59	1120	0.910	1.060	11.58
1990-91	25.26	32.70	1313	0.830	1.040	12.48
1995-96	25.39	33.90	1354	0.860	0.950	11.07
1996-97	25.28	33.28	1336	0.880	1.170	13.32
1997-98	25.26	33.83	1359	0.860	1.000	12.99
1998-99	24.54	32.55	1326	0.900	0.910	10.11
1999-2000	26.52	39.00	1470	0.850	1.200	11.75

Table-II

Year	Pulse			Oilseeds		
	Area	Production	Yield/ha.	Area	Production	Yield/ha.
1951-52	0.81	0.28	347	1.25	0.53	434
1960-61	0.74	0.26	356	1.25	0.48	386
1970-71	0.84	0.32	379	1.49	0.62	416
1980-81	1.11	0.46	432	2.17	1.05	485
1990-91	1.21	0.52	433	3.40	1.90	559

1995-96	1.18	0.63	534	3.33	1.87	560
1996-97	1.30	0.75	578	3.35	1.84	551
1997-98	1.28	0.71	552	3.46	2.04	589
1998-99	1.38	0.74	536	3.44	1.75	508
1999-2000	1.50	1.00	666	3.84	2.41	627

Area = Lakh hectares; Production = Lakh MT; Yield/ha. = Kg.

3.2 HORTICULTURE :

The total area under major horticultural crops in the state is 5,42,942 hectares out of which fruit crops occupy an area of 1,04,816 hect. , spices 78,633 hect., tuber 86,391 hect., nut crops 94,623 hect. and vegetables occupy 1,78,479 hectares.

The existing area and production of major horticultural crops in Assam and the area (district) where the crops are predominantly grown are indicated below :

Table III

Sl. No.	Name of the crop	Area in hect.	Production in M.T.	Average yield kg./ha.	District where predominantly grown
1.	Banana	41,885	5,81,884	13,892	Barpeta, Kamrup, Nagaon, Cachar, Nalbari, Goalpara, Jorhat, Golaghat, Sonitpur, Sibsagar, Tinsukia
2.	Pineapple	13,582	2,08,993	15,387	Kamrup, Nagaon, Karbi Anglong, N.C. Hills, Cachar
3.	Orange	5,720	67,659	11,820	Tinsukia, Karbi Anglong, North Cachar, Kamrup, Goalpara, Darrang, Dibrugarh
4.	Papaya	7,347	1,08,479	14,765	Nagaon, Darrang, Kamrup, Karbi Anglong, N. Cachar, Nalbari, Barpeta, Sonitpur, Dhubri
5.	Assam lemon	8,705	47,233	5,426	All districts of Assam
6.	Guava	3,681	47,611	12,934	All districts of Assam
7.	Litchi	4,028	16,815	4,175	All districts of Assam-mainly Kamrup, Sonitpur and Bongaigaon
8.	Jack-fruit	17,298	1,53,645	8,882	All districts of Assam
9.	Mango	2,570	17,173	6,682	All districts of Assam
Total :		1,04,816	12,49,492	1,192	

SPICES :

1.	Chilli	14,724	9,619	658	Dhubri, Barpeta, Darrang, Nagaon
2.	Turmeric	10,729	7,416	691	Kamrup, Darrang, Nagaon, Barpeta, Sonitpur, Nalbari, Bongaigaon
3.	Onion	8,083	18,341	2261	Barpeta, Nagaon, Dhubri
4.	Ginger	16,244	1,13,771	7280	N.C. Hills, Cachar, Karbi Anglong, Kamrup, Barpeta, Sonitpur, Nagaon

5.	Coriander	19,346	14,354	742	Dhubri, Nalbari, Kamrup, Barpeta, Sonitpur, Nagaon, Morigaon, Darrang, Goalpara
6.	Garlic	7,430	21,694	2920	Dhubri, Kamrup, Barpeta, Nagaon, Lakhimpur, Goalpara, Darrang
7.	Black pepper	2,077	2,810	1353	Jorhat, Sibsagar, Kamrup, Nagaon, Golaghat, Dibrugarh, Cachar, Barpeta
Total :		78,633	1,88,076	2392	

NUT CROPS :

1.	Coconut	20,166	1,49,866 (in '000 nos)	69 nos. (per tree)	Nagaon, Nalbari, Kamrup, Morigaon
2.	Areca nut	74,457	55,355 (dry nuts)	131 nos. (per tree)	All districts of Assam
Total :		94,623			

TUBER CROPS :

1.	Potato	76,958	6,11,077	9740	Barpeta, Darrang, Kamrup, Sonitpur, Nagaon, Dhubri, Nalbari
2.	Sweet potato	9,43	32,437	3438	Dhubri, Kamrup,
3.	Tapioca	2,798	13,261	4739`	Kokrajhar, Nalbari, Darrang, Karbi Anglong, Goalpara
Total :		86,391	6,56,775	7602	

VEGETABLES :

1.	Kharif	56,857	5,37,786	9,411	All districts of Assam
2.	Rabi Veg.	1,21,622	18,45,435	15,230	All districts of Assam
Total :		1,78,479	23,83,221	13,205	

3.3 IRRIGATION :

From the time of independence till 1995-96, 61,428 Shallow Tube Wells were installed in Assam. During the next four years, Assam saw a quantum jump both in terms of number of tube wells installed and area irrigated. Financial assistance was availed of from the World Bank (ARIASP) and NABARD (SKY) resulting in installation of an additional 62,250 Shallow Tube Wells within March 2000 (32,250 under ARIASP and 30,000 under SKY). Another 70,000 Shallow Tube Wells are being installed under NABARD and expected to be completed soon and 15,000 under World Bank by March 2001. It means that by March 2001 installation of a total number of 1,47,250 Shallow Tube Wells will be completed which will provide assured irrigation to 2,94,500 ha. land and including the Shallow Tube Wells installed prior to 1995-96, the total assured irrigation will be available in 5.27 lakh ha.

3.4 TREND OF FERTILIZER CONSUMPTION :

The trend of fertilizer consumption in Assam in terms of nutrients (N, P₂O₅, K₂O) per hectare is shown below:

Year Kg./Ha.

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1971-72	2.4
1981-82	3.3
1991-92	10.4
1995-96	13.0
1996-97	14.2
1997-98	18.2
1998-99	21.1
1999-2000	29.3

The projected consumption of fertilizer nutrients per hectare has been fixed at 50 kg in 2000-2001 and 70 kg from 2005-2006 onwards. It is not the intention of the Agriculture Department to go beyond 70 kg./ha. and additional requirement would be met through Integrated Nutrient Management like use of organic manures, bio-fertilizers and green manuring to maintain soil health.

3.4 SEEDS :

Assam was once wholly dependent on outside supply for meeting its own requirement of seed till Assam State Seed Certification Agency (ASSCA) was constituted in the year 1985. But till now the State could not achieve self-sufficiency in production of its own requirement of seeds except paddy and mustard due to infrastructural inadequacy. It is essential that the seeds required for production programme of the State is produced within the State to ensure timely supply of seeds in quality and quantity to the farmers. From the experience it can be inferred that the Assam Seeds Corporation Ltd. may not be able to produce all the required quantities of certified seeds of various crop, whose seeds can be produced in the State, due to their infrastructural inadequacy including the finance. About 40 Nos. of Seed farms belonging to the Department of Agriculture have been proposed to be leased out to private entrepreneurs with an idea of producing certified seeds in accordance with the requirement of the State. The seed farms which are already leased out have started producing certified seeds of the varieties which are locally in demand. Thus seed production and marketing through seed merchants / traders/ entrepreneurs are to be encouraged for attaining self-sufficiency in seed production in the State.

3.5 AGRICULTURAL MECHANISATION :

The growth of mechanization in Assam is slow. However, after introduction of large scale Shallow Tube Well irrigation, requirement of farm power has gone up. The present position of mechanization is as follows:

The following are the estimates of power for raising agriculture crops in Assam..

Category of power	Amount (HP per hectare)
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Human power	0.09
Animal power	0.204
Mechanical power	0.008
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Total available power	0.302

The current power availability to the farmers of the State is barely 0.3 HP per hect. which has become one of the constraints towards increase of area under double or multiple cropping.

It is obvious that farm mechanization is imperative to supplement the poor bullock draught power which is grossly inadequate to meet the challenging task of covering additional areas under cultivation.

The present status of machineries in the state reflects a picture of grossly inadequate availability of mechanical power.

a. Total Nos. of M. Wheel Tractors (Four Wheel Tractor) including Govt. sector.	678
b. Total Nos. of Power Tillers (Two wheel Tractors) including Govt. sector.	5,002

c.	Total Nos. of M.B.plough	1,10,477
d.	Total Nos. of paddy weeder	17,926
e.	Total Nos. of Dry land weeder	2,032
f.	Seed Drill	722
g.	Total Nos. of Bullock Drawn puddler	149
h.	Total Nos. of paddy cultivator	4,723
i.	Total Nos. of Harrow	465
j.	Total Nos. of other implements	1,67,449

The density of Tractor is 0.26 per thousand hectare and that of Power Tiller is 0.51 per thousand hectare.

4. FUTURE OUTLOOK :

4.1 SUSTAINABLE AGRICULTURE :

Agriculture depends on natural environment of a place like land, air, flora, fauna and water. But destruction of natural resources and environment introduces of limiting factor for agricultural production. It is important for us to harvest crops without decrease in yield over time so as to feed the growing population. Therefore, in the present context of rapid degradation of natural environment, the question of sustainability refers to “ meeting the needs of the present generation without compromising the needs of future generations”.

Degradation of environment has threatened major age old eco-systems of Assam like swamps and drainage systems. Water bodies are progressively filled up or choked. Many land and aquatic life forms are on the brink of extinction, which affect crop production. The forest cover in the state is fast dwindling which has caused man-made climatic aberrations (as experienced now) and degradation of soil. Clearing of forest encourages soil erosion and run-off without affording any time for percolation of rain water to deeper soil layers for recharge of ground water. Thus ground water hydrology is affected.

The destruction of forest cover in adjoining hills of Assam resulted in silting up of water bodies and water courses. This besides inundating a vast area of valley and causing flash flood in foot hills, is also rendering thousands of hectares of land unproductive due to deposition of sand. The inundation and flash flood is causing huge loss of crop production together with destruction and damage of infrastructure and human habitation.

Occurrence of drought is also a regular phenomenon due to degradation of natural eco-system and irregular breaks in rainfall. The extent of loss of crop production due to drought cannot be underestimated and leaves an impact on the economy of the farming community.

High population pressure on land, besides damaging the environment, has changed land use pattern from agricultural to non- agricultural use resulting in shrinkage of cultivable land. During the next 25 years projected population increase is about 178 lakh, which is more than half of the present population of Assam. The gradual settlement of this additional population will take away about 2 lakh hectares from the existing cultivated area for habitation requirements in the next quarter century.

In the light of the above, the problem of sustainable agriculture can be addressed with the combined strategies of conservation of natural resources and poverty alleviation, which are outlined below.

CONSERVATION OF NATURAL RESOURCES STRATEGIES :

1. Protection of forest and soil.
2. Conservation of rainwater.
3. Development of natural eco-systems like swamps and beels.

POVERTY ALLEVIATION STRATEGY :

1. Sustainable methods of agricultural production.
2. Women's involvement.

3. Land reform and access to inputs for marginal and small farmers.

STRATEGIES FOR CONSERVATION OF NATURAL RESOURCES :

1. PROTECTION OF FOREST AND SOIL :

The existing forest area is to be protected at any cost for economic survival of the people of Assam. Along with the forests, the soil wealth is also to be protected adopting soil conservation measures. However, both types of protection is to be converted to a people's conservation movement. Scarcity of firewood among the poor leads to destruction of forests. Introduction of farm forestry into agriculture would ease the demand of fuel and fodder for animals and thereby help preserve our forest.

2. CONSERVATION OF RAIN WATER :

In-situ conservation of rainwater is most important. The National Watershed Development Project for Rainfed Areas (NWDPPRA) presently implemented by Agriculture Department as centrally sponsored scheme is doing useful work in Assam. However, greater stress may be given for construction of rainwater harvesting structures for recharging ground water besides taking advantage of part time fish culture and irrigation from them.

3. DEVELOPMENT OF NATURAL ECOSYSTEMS LIKE SWAMPS AND BEELS :

Progressive choking up of swamps and beels must be stopped. A special programme may be started to decongest the water bodies and to remove silt from the swamps or beels taking assistance if necessary from international funding agencies. The DRDAs also may play a role in this respect. This will help improve environment of our natural heritage, create recreation sites and recharge ground water besides providing shelter to fish and birds.

STRATEGIES FOR POVERTY ALLEVIATION :

1. SUSTAINABLE METHODS OF AGRICULTURAL PRODUCTION :

Excessive use of chemicals in agriculture tends to pollute land and water. This may be avoided by using Integrated Pest Management (IPM), Integrated Nutrient Management (INM) and organic farming. The Assam Agriculture Department has already introduced IPM technique in the State's agriculture and imparted training to field officers. This is to be vigorously pursued now. Infrastructural facilities for supply of bio-control agent is to be widened. Ground water used extensively now for irrigation in Assam is to be monitored for content of any toxic substances so that they cannot pollute land and crops. Recent discovery of fluoride in excessive concentration in the ground water of Karbi Anglong district is a case in point, which is a health hazard.

2. WOMEN'S INVOLVEMENT :

Women play a pivotal role in management of resources of household and community. Fuel and water supplies, backyard poultry, weaving, kitchen gardening and a lot of farm activities from planting to harvesting, drying, milling etc. are taken care of by women besides attending to their regular work of cooking, cleaning and looking after the family members. Generally women are left out of training programmes designed for skill development required after introduction of new technology or innovations. Child nutrition, hygiene and lowering fertility rates are related to women's education. But lower educational attainment of women pose a problem in the fight against poverty perpetuating process. Women's skill upgradation and education will remain a precondition for successful environment management in Assam for a long time to come. Women are to be always at the center of sustainable agricultural programmes.

3. LAND REFORM AND ACCESS TO INPUTS FOR MARGINAL AND SMALL FARMERS :

Environmental degradation is related to poverty. Raising the productivity of existing resources of the poor is a very important criterion for preservation of environment and sustainable agriculture. Land reform to transfer rights to sharecroppers and making availability of agricultural inputs including credit easy to marginal and small farmers would go a long way in raising agricultural productivity and income of the poor.

4.2 SELF SUFFICIENCY IN FOOD :

A. FOOD GRAIN PRODUCTION :

Food grain crop consists of Rice, Wheat & Pulses. Requirement of food is dependent on population. Taking a growth rate of population as 2.11 P.C. from 2000-01 to 2009-2010 and 2.00 P.C. from 2010 – 2011 to 2025 – 2026 the projected population of the state as well as requirements of food grains will be as under :

Table IV

Year	Population	Adult equivalent	Rice (in MT)	Wheat (in MT)	Pulses (in MT)	Total (in MT)
2000-2001	27159300	21727440	4282478	570997	570997	5424472
2001-2002	27732361	22185889	4372839	583045	583045	5538929
2002-2003	28317514	22654011	4465106	595347	595347	5655800
2003-2004	28915014	23132011	4559319	607909	607909	5775137
2004-2005	29525120	23620096	4655521	620736	620736	5896993
2005-2006	30148100	24118480	4753752	633834	633834	6021420
2006-2007	30784225	24627380	4854057	647208	647208	6148473
2007-2008	31433772	25147018	4956477	660864	660864	6148473
2008-2009	32097025	25677620	5061059	674808	674808	6410675
2009-2010	32774272	26219418	5167847	689046	689046	6545939
2010-2011	33429758	26743806	5271204	702827	702827	6676858
2011-2012	34098353	27278682	5376628	716884	716884	6810396
2012-2013	34780320	27824256	5484161	731221	731221	6946603
2013-2014	35475926	28380741	5593844	745846	745846	7085536
2014-2015	36185445	28948356	5705721	760763	760763	7227247
2015-2016	36909154	29527323	5819835	775978	775978	7371791
2016-2017	37647337	30117870	5936232	791498	791498	7519228
2017-2018	38400284	30720227	6054957	807328	807328	7669613
2018-2019	39168289	31334631	6176056	823474	823474	7823004
2019-2020	39951655	31961324	6299577	839944	839944	7979465
2020-2021	40750688	32600551	6425569	856742	856742	8139053
2021-2022	41565702	33252562	6554080	873877	873877	8301834
2022-2023	42397016	33917613	6685161	891355	891355	8467871
2023-2024	43244956	34595965	6818865	909182	909182	8637229
2024-2025	44109855	35287884	6955242	927366	927366	8809974
2025-2026	44992053	35993642	7094347	945913	945913	8986173

The state of Assam comprising 21 number of plain districts and two number of hill districts fall under high potential zone for raising agricultural productivity. Self-sufficiency in production of rice and to reduce to a possible extent the shortfall in

other items of food grains viz., wheat and pulse are the primary objectives of the state. Having considered the rabi season as the vital period for the growth of agriculture in the state due to uncertainties prevailing during kharif season, the Government have set priorities in the development of infrastructure in the area of minor irrigation, agricultural mechanization, enhancement of fertilizer consumption rate and production of certified seeds.

Among the food grain crops, rice is the principal crop grown in three seasons viz., Autumn (Ahu), Winter (Sali) and Summer (Boro & Early Ahu). Production of food grains in the state is primarily dependent on production of Winter rice which covers about 72 P.C. of the rice growing area. The crop is sown in the rainy season and is, therefore, subject to heavy flood almost every year. Because of the unstable nature of production, the area under summer rice is on the rise. With the higher productivity of summer rice among all rices grown in the state, Assam recorded an impressive increase in rice production during 1999-2000 producing about 39 lakh MT. If 20 P.C. of production is deducted for storage loss, animal feed etc., Assam had marginal deficit in rice during 1999-2000. But with the launching of the STW programme under World Bank (ARIASP) and NABARD (SKY) assistance, there was increase of about one lakh hectare area under summer rice which increased production. The scope of the STW programme is currently being expanded further and it can be expected that both productivity and production of total rice will increase sharply in Assam.

The productivity of rice in Assam is around 1500 kg/ha against national average of approximately 2000 kg/ha during 1999-2000. Required productivity over the next 25 years to maintain self sufficiency in rice are projected below :

Year	* Gross rice area in lakh hect.	Productivity kg./hect.	Total production in lakh MT
2000-01	27	2200	59.40
2005-06	30	2500	75.00
2006-07	30	3340	100.20
2010-11	30	3500	105.00
2015-16	30	3800	114.00
2020-21	30	4000	120.00
2025-26	30	4500	135.00

* Area likely to increase with the expansion of irrigation.

STRATEGIES TO INCREASE PRODUCTIVITY OF RICE :

1. Expansion of assured irrigation to cover 15 lakh hect. at the end of 2010.
2. Increase the fertilizer consumption to 70 kg./hect. by 2010.
3. Increase in seed replacement rate to 12% including Hybrid Rice.
4. Introduction of mechanization.
5. Adoption of intensive IPM and INM in rice.

In consideration of above facts, it can be safely said that Assam will attain self-sufficiency in rice from 2000-2001 onwards.

B. PULSE :

Pulses are rich sources of protein in our diet. They can be cultivated in various cropping systems without disturbing the main crops in the rotation. Besides, they can fix atmospheric nitrogen in the soil and hence have become very important in the context of developing sustainable agriculture in Assam. Besides intensification of agricultural activities with ground water utilization at present times also warrants pulse cultivation to stabilize soil health.

Production of pulses is around 80,000 MT at present which can meet a little over 20% requirement of the State. The common kharif pulses are Arahar, Black gram and Green gram and rabi pulses are Lentil, Pea, Black gram, Green gram, Chickpea and Rajmah. Low production of pulses in the State is attributed to (a). Soil acidity, (b) lack of suitable improved seed and (c) Lack of infrastructure for storage.

Requirement of pulses shown at 5 year intervals from 2000-2001 to 2020-2021 :

Year -----	Requirement calculated @ 60 gm/adult/day in lakh MT -----	Requirement calculated @ 30 gm/adult/day + 20% for seed, feed and storage loss -----
2000-01	4.76	2.85
2005-06	5.28	3.17
2010-11	5.87	3.53
2015-16	6.51	3.90
2020-21	7.23	4.34
2025-26	7.88	4.73

Estimate of reduced requirement of pulses has been shown in the above table in consideration of the following :

1. Very high prices of pulses force the people to reduce consumption.
2. Fish being a common ingredient of our diet, supplement protein requirement substantially.
3. People in many rural areas of Assam usually meet their pulse requirement partially through dried country beans.

PULSE PRODUCTION PROGRAMME IN ASSAM :

The gap between requirement and production is met by importing pulses worth about Rs. 400 crores annually to the State. Therefore, removal of deficit has assumed great importance and endeavours would be made to decrease the gap between supply and demand to the extent possible. Cultivation of pulses is to be supported by the post harvest management like Dal Processing Plants and storage bins where rural youths can find employment over and above engagements in crop production.

STRATEGIES FOR PULSE CULTIVATION IN ASSAM :

1. Increase of area under rabi pulse by another 1.75 lakh hectares by 2025-26.
2. Increase of productivity from the present level of 600 kg/ha to 1200 kg/ha by 2025-26.
3. Increase of area under Arahar (Pigeon Pea) during kharif.
4. Popularization of modern pulse production technology like improved seeds and use of bio-fertilizers.
5. Introduction of rabi pulse as intermediate crop under irrigated ecology –

Cropping sequence to be followed :

Kharif Rice (June – Oct/Nov) ----- Rabi Pulse (Nov – Jan/Feb)
 Summer Rice (Jan/Feb – May/June)
 This can maintain soil health / fertility.

6. Production of pulse seeds through seed village concept.

Proposed targets for pulse production at 5 yearly intervals from 2000-01 to 2025-26 :

Year -----	Area target In lakh hect. -----	Production In lakh MT -----	Productivity In kg./ha. -----	Percentage of deficit -----
2000-01	1.50	0.90	600	68%
2005-06	2.00	1.40	700	56%
2010-11	2.50	1.88	750	47%
2015-16	2.75	2.34	850	40%
2020-21	3.00	3.00	1000	31%
2025-26	3.25	3.90	1200	18% (marginal)

C. OILSEED :

Rape and Mustard are major oil seed crops of Assam.. Other oil seed crops cultivated during the Rabi season are Sunflower, Groundnut and Nizer and Sesamum and soybean are cultivated during the kharif season. Rape and mustard cover about 2.25 lakh hectare in Assam. Coverage under other oilseed crops is not significant. Overall productivity of oil seeds in Assam is around 600 Kg per hectare which is almost half the national average. In Assam oil seeds are raised under rainfed condition with low level of modern agro technique. Therefore, productivity is low as compared to the national average. Thrust given on research by the A.A.U. has produced two varieties of Toria viz., TS-36 and TS-38 with yield potential of 1.5 MT per hectare. This is being pursued further. In the event of increase in the net irrigated area to a large extent, it is likely that rabi oil seeds will be cultivated more and more with irrigation. This will push up the productivity of oil seeds.

At present Assam produces around 60 percent of her total requirement. The vision of the state in oil seed production during the next 25 years is progressively narrowing down the deficit and then achieving surplus through a combination of modern production technology and improved service facilities supported by appropriate government policy. Higher oil seeds production will create more employment in the entire chain from production to processing and marketing.

Requirement of oil seeds of Assam at 5 yearly interval is given below :

Year -----	Requirement of oil seeds -----	Remarks (in lakh MT) -----
2000-01	3.81	<u>Requirement of oil include :</u>
2005-06	4.23	(1) 40 gms per adult per day.
2010-11	4.68	(2) Seed and wastage – Add. 20%.
2015-16	5.17	
2020-21	5.71	
2025-26	6.31	

Projected area, production, productivity and deficit/ surplus situation of oil seeds in Assam during the next 25 years is shown below :

Year -----	Area lakh hect. -----	Productivity Kg/ Hect -----	Production lakh MT -----	Percent deficit/ surplus -----
2000-01	4.00	650	2.60	(-) 32
2005-06	4.15	700	2.90	(-) 31
2010-11	4.25	800	3.40	(-) 28
2015-16	4.50	1000	4.50	(-) 13
2020-21	4.75	1200	5.70	0
2025-26	5.00	1500	7.50	(+) 19

Strategies and approaches of increasing oil seeds production :

1. Increase in area.
 - a. Expansion of area in monocropped Sali land.
 - b. Expansion of areas of non-traditional oil seeds like ground nut and sunflower.
2. Increase in productivity.

- a. Replacement of old varieties with the newly developed high yielding varieties.
 - b. Increase in fertilizer consumption.
 - c. Conversion of rainfed to irrigated oil seeds
3. Improvement in post harvest and marketing management.

D. HORTICULTURE :

The State of Assam has almost attained self-sufficiency in its requirement of cereals – more particularly rice and as the position stands today, the State is looking for export. Now all eyes are set on the protective food sector i.e. fruits, vegetables and other horticultural crops. On the basis of per capita requirement the State is marginally surplus both in fruits and vegetables. During 1998-99, the State had a population of 2.62 crores and on that basis the requirement is calculated at 6,88,657 MT in case of fruits and that of vegetables is 21,42,488 MT. Against this requirement, our present production of fruits and vegetables are 12,49,492 MT and 30,26,735 MT, respectively. The fate of this surplus quantity either becomes a part of heavy post harvest loss or becomes a component of the regular outflow to the neighbouring deficit states. Though the scenario is somewhat better, it is necessary to look for immediate strategy if we are to go ahead on the basis of increasing population, market demand, projected requirements in the coming years for sustainability, income and employment generation. The requirement of fruits, vegetables and spices for next 25 years i.e. from 2000 to 2025 is projected in Table - V below :

Table V
PROJECTED POPULATION AND
REQUIREMENT OF FRUITS, VEGETABLES & SPICES FROM 2000-2001 TO 2020-2021

Year	Projected population	Adult equivalent	Requirement in MT			Remarks
			Fruits	Vegetables	Spices	
2000-2001	2,71,59,300	2,17,27,440	7,13,746	20,20,544	79,305	
2005-2006	3,01,53,268	2,41,22,614	7,92,428	24,65,331	88,048	
2010-2011	3,34,77,288	2,67,81,826	8,79,783	27,37,103	97,754	
2015-2016	3,71,67,727	2,97,34,182	9,76,767	30,38,833	1,08,530	
2020-2021	4,12,69,997	3,30,11,997	10,84,444	33,73,826	1,20,494	
2025-1026	4,49,92,053	3,59,93,642	11,82,391	36,78,550	1,31,377	

From the above table it is clear that the requirement of fruits in the year 2025-2026 will be 11,82,391 MT. However, the above figure is the consumption requirement of adult equivalent of total population of the State. The production of fruits during 1998-99 was 12,49,492 MT against the consumption requirement of 6,88,657 MT indicating that approximately 45% of the production is either marketed / exported outside State or get wasted. There is ample opportunity to export fruits like Banana, Pineapple, Orange, Jackfruit, Litchi etc. as raw fruit, processed fruit and after primary processing to other States of India as well as outside the country. In fact, export of some commodities has already started across the border and this trade is likely to be expanded in near future. Considering all these above factors, the vision of 2025-2026 is outlined in Table VI. Increase in production is aimed by expansion of area presently remaining as cultivable waste in the upland and hilly tracts and by vertical increase of production.

So far as vegetables are concerned the requirement by 2025-2026 will be 36,78,550 MT against the current total production of 30,26,735 MT indicating that the State will be short by 6,51,815 MT if the production remains static over the years. However, as the vegetables are highly perishable commodities the wastage is more in comparison to other crops. Besides, the State of Assam is being surrounded by deficit states and countries, hence outflow is obvious. Taking into consideration of all the above factors the future production is targeted at 50% above the actual consumption requirement assuming that 20% will be lost on account of field wastage and transportation and 30% will be marketed outside that State – either as raw or as processed vegetables. The targeted area and production is given in Table VI. The increase in area under vegetables will be effected by bringing feasible mono-cropped area of Sali under vegetable cultivation during rabi season and

by increasing cropping intensity by introduction of kharif vegetables in typical and feasible flood free rabi vegetables areas as well as by increasing inter-cropping of kharif vegetables in areas covered by fruits and nuts.

There are wide varieties of medicinal and aromatic plants in the State and the State being a hot spot of bio-diversity, there is immense potentiality for production of different kinds of medicinal and aromatic plants. The Small Farmers' Agri-business Consortium (SFAC) will take a lead by contacting the Pharmaceutical and Aromatic Industries for contract production in first phase followed by pilot scale production of selected medicinal and aromatic plants and then the mass production of medicinal and aromatic plants accompanied with setting-up distillation plants and processing plants is targeted. Projected figures on area and production are shown in Table VI.

It is estimated that the projected requirement of spices during 2025 will be 1,31,377 MT (Table V) whereas our existing production is 1,88,076 MT. The present production is exceeding by 145% and a sizeable quantities of Chilly, Ginger & Coriander are going out of the State. Considering the present trend of growth, an achievable target will be 5,23,229 MT during 2025 i.e. an excess of 3,35,153 MT over the present production. To achieve this target, the strategy will be area expansion mostly as mixed crop with other plantations as well as by increasing production per unit area with improved inputs & technology. This sector will be treated as a major sector for employment generation. The projected area and production of Spices is shown in Table VI.

There is no authentic data on existing area and production of wide range of floriculture crops but according to rough estimate, this sector covers an area of 140 Hectare. Floriculture though has enough potentiality, is still at its infancy. Orchids, Anthurium, Gladiolus, Marigold, Rose have taken some roots on the commercial front but owing to rapid change in market trend more species like Jasmine, Lily, Gerbera may enter the market. Oil extraction from Jasmine, Tuberose, Rose may also be profitable venture. Thus considering the global trend and normally available rich stock of orchids, this crop will be put under commercial venture on priority followed by Anthurium, Gladioli, Roses, Jasmine and tuberose. The projected expansion of area and production till 2025-2026 has been assessed in Table VI.

The overall scenario of horticulture in Assam in near future by and large is expected to be highly commercial and market oriented – with the incorporation of horticulture based industrial growth – particularly in the form of establishment of cold storages, processing units like Ginger dehydration, Turmeric, Pepper processing, oleoresin / oil extraction units, semi-processed product manufacture, production of concentrates, distillation units for medicinal and aromatic plants, establishment of tissue culture units etc. with tremendous – employment generation. Finished and semi processed products may be marketed with appropriate arrangement with private sector with brand image having a wide marketing network in India. Generation of employment is also expected under area expansion thrust for crops like cashew nut, vegetables etc. establishment and setting up of primary processing unit, distillation unit, cold storage etc. The rapid stride in farm mechanization and ever expanding lucrative markets will invite entrepreneur to venture into these sectors. Establishment of sophisticated nurseries, Orchid growers network, TPS & other vegetable seeds production and marketing etc. are envisaged and likely to attract NGOs and entrepreneur to step into such sectors ensuring more and more employment. It is estimated that in case of cereals the employment generation is 150 to 200 man days per hectare where as horticultural sector can accommodate 350 to 2500 man days per hectare. In accordance with table II, we can expect generation of employment to the tune of 62 crore man days by 2025 even at a very modest estimate assuming that only 50% of the total targeted area will be explored by commercial units.

Table VI
TARGETTED AREA AND PRODUCTION OF FRUITS, VEGETABLES, SPICES, FLOWERS AND MEDICINAL & AROMATIC PLANTS
FOR NEXT 25 YEARS

Year	Fruit Crops		Vegetable Crops		Spices		Flowers		Medicinal & Aromatic Plants		Remarks
	Area (in Ha.)	Production (in MT)	Area (in Ha.)	Production (in MT)	Area (in Ha.)	Production (in MT)	Area (in Ha.)	Production (in MT)	Area (in Ha.)	Production (in MT)	
1998-99	1,04,816	12,49,492	2,64,870	30,26,735 (13.20MT/ha)	78,633	1,88,076	140	-	-	-	Increase in area in case of fruit is taken as 25% per annum, in case of vegetables the increase is aimed at 1% per annum and in case of spices the increase is projected as 1.5% per annum.
2000-01	1,10,057	12,20,684 (12.00MT/ha)	2,70,167	35,93,221 (13.30MT/ha)	80,991	1,94,378 (2.40MT/ha)	300	900	600	1,800	
2005-06	1,23,814	16,09,582 (13.00MT/ha)	2,83,675	39,71,450 (14.00MT/ha)	87,065	2,61,195 (3.00MT/ha)	800	4,000	800	2,400	
2010-11	1,39,291	19,50,074 (14.00MT/ha)	2,97,859	44,67,885 (15.00MT/ha)	93,595	3,27,583 (3.50MT/ha)	1,050	6,300	1,000	4,000	
2015-16	1,56,702	23,50,530 (15.00MT/ha)	3,12,751	50,04,016 (16.00MT/ha)	1,00,615	4,02,460 (4.00MT/ha)	1,200	8,400	1,200	4,800	
2020-21	1,76,289	28,20,620 (16.00MT/ha)	3,28,388	55,82,596 (17.00MT/ha)	1,08,161	4,32,644 (4.00MT/ha)	1,450	10,875	1,600	6,400	
2025-26	1,98,325	32,72,362 16.50MT/ha	3,44,807	58,61,719 (16.50MT/ha)	1,16,273	5,23,229 4.50MT/ha	1,750	14,000	2,100	9,450	

4.3 HILL AGRICULTURE :

Karbi Anglong and North Cachar Hills are two hill districts of Assam. Agriculture in the hill districts have their own problems like jhum cultivation, infrastructural weakness, low productivity etc. Intensive jhuming has accelerated soil erosion. But jhuming is a way of life for the hill people. Weaning them away from jhum cultivation is a great challenge before the State. Introduction of new schemes for production of cash crops, horticultural crops and settled agriculture in terrace lands will remain a priority in the coming decades. Infrastructural development and access to markets will be special areas of concern in development of hill agriculture. Exploitation of horticultural potentialities through introduction of suitable fruits and spices and their value addition will substantially contribute towards the economy of the hill people.

4.4 EMPLOYMENT GENERATION :

In any poverty alleviation effort, employment generation is an important component to facilitate distribution of income and equity. The open unemployment situation of the State has acquired a serious proportion. The burgeoning labour force of the State is comprised of relatively young people in the age group of 15 – 35 years. The employment situation can be tackled to a great extent by taking actions in two fronts, viz. service sector and farming.

SERVICE SECTOR EMPLOYMENT :

There is wide scope for creation of employment in the field of agro-service. Rural youths can take up employment by setting up inputs supplying outlets for seeds, fertilizers and pesticides combining with it custom hiring facilities of agricultural machineries. There are 2,486 Gaon Panchayats in Assam. Initially one Agro-Service Centre can be established in each Gaon Panchayat selecting youth having either I.T.I. qualification or knowledge of machineries. Each Agro-Service Centre will have at least one tractor with all accessories and trailer along with some other minor machineries and implements for custom hiring. The Centre will also have seeds, fertilizers and pesticides etc. for sale.

In the horticulture sector and marketing there will be vast employment potentialities in various services.

FARM SECTOR EMPLOYMENT :

The youths between the age group of 18 and 35 years form the bulk of State's labour force who are subject to rampant open unemployment. Formal educational system in the State cannot prepare them for jobs in modern sector employment nor self-employment scope in different enterprises is wide due to limited economic infrastructure. Employment avenue in government sector is also shrinking fast due to attempts at curbing government expenditure. As a result vast human capital remains unutilized for welfare of the State. The outcome of it all is that youths lose self-esteem, which creates discontentment.

Agriculture and allied sector has the potentiality to absorb the rural youths in large scale for gainful employment. An educated youth belonging to a household having at least 10 bighas of land can be self-employed with support from the government. Ten bighas of land have been considered here as a unit of operation which will allow certain economies of scale. If educated youths can be attracted in a large scale to agriculture, it will hasten transition of subsistence agriculture to diversified and commercial agriculture. The youths of lower income families of rural areas tend to perform poorly in their educational pursuit due to their disadvantaged circumstances. Private costs of education are higher for them and they often leave institutions without completing. Poor rural youths cannot progress in the educational ladder. Therefore, poor rural youths deserve preference in the proposed agricultural development programme.

It is estimated that there are about 3 – 4 lakh households in the State having land holdings of 10 bighas or more. But youths of these households to be brought under this programme will be much less. In the premises of the above background, a scheme is formulated to extend support to the rural youths of the State for employment in agriculture.

MODALITIES OF IMPLEMENTATION OF THE SCHEME :

1. FORMATION OF AN AGENCY FOR IMPLEMENTATION OF THE SCHEME :

A Young Farmers' Development Agency (YFDA) will be formed in each district to administer and co-ordinate various activities of the scheme with the Department of Agriculture as Nodal Department.

OBJECTIVES :

- i. Increase of agricultural production and incomes of beneficiaries through adoption of appropriate technology.

- ii. To ease the unemployment problem of the State.
- iii. Transition of subsistence agriculture to diversified and commercial agriculture.
- iv. Mobilization of savings from beneficiaries for future investment in agriculture.
- v. To restore confidence in the minds of the youths to increase self-esteem.

2. **TARGET :** 10,000 Youths in phases.

3. **SELECTION CRITERIA :**

- A. ESSENTIAL :**
- a. Age between 18 – 35 years.
 - b. Does not occupy an office of profit.
 - c. Presently a practising farmer.
 - d. The family of the beneficiary possesses at least 10 bighas of unencumbered Myadi Land and must not be scattered in more than two parcels. Land should be hazard free.
 - e. Successfully completed at least primary schooling.
 - f. Desirous of becoming a life long farmer.
 - g. Must possess sound health.
 - h. Must belong to financially weaker section of society.
- B. DESIRABLE :**
- a. Self or parent is a member of local Pathar Parichalana Samitee (FMC).
 - b. Proven record of interest in agriculture.
 - c. Knowledge of modern agriculture.
 - d. Higher educational qualification.
 - e. Must be inclined to serve society.

4. **SELECTION PROCEDURE :**

Applications will be invited through newspapers for selection of beneficiaries. The candidates will be selected through an interview and verification of required information under the supervision of Deputy Commissioner.

Selected candidates will be trained under a three months orientation course. On successful completion of the course and execution of a declaration to the effect that he / she will remain a life long farmer; the candidate will be registered under Agriculture Department as a beneficiary of the scheme.

5. **TYPES OF ASSISTANCE :**

- i. Each beneficiary will be given a monthly incentive of Rs. 200.00, which will be deposited in a Provident Fund specially created for the purpose. Beneficiaries will be allowed to temporarily withdraw money to meet contingent situation.
- ii. On attainment of 60 years of age each beneficiary will be given monthly pension. A Corpus Fund will have to be created for this purpose through a legislation.
- iii. Beneficiaries will be regularly provided with new technological information for improving productivity.
- iv. Beneficiaries will be provided with inputs from usual schemes to the extent possible.

6. FINANCIAL INVOLVEMENT :

a.	Monthly incentive for 10,000 beneficiaries @ Rs. 200.00	Rs. 2.40 Crores
b.	Subsidy to the extent of Rs. 70,000.00 for purchase of a Power Tiller. (Total No. 10,000)	Rs. 70.00 Crores
c.	Computers and Office Stationeries	Rs. 0.30 Crores
d.	Training expenditure for 10,000 beneficiaries	Rs. 2.00 Crores
e.	Capital and contingent expenditure	Rs. 3.30 Crores

		Rs. 78.00 Crores

7. MONITORING :

Success of this scheme will depend on constant monitoring of activities of the beneficiaries. Nature and quantum of information to be handled are too complex and numerous for manual operation. Therefore, computers are to be used in each district for maintaining basic information of beneficiaries, their current performance, production level of agricultural commodities and disbursement position of monthly incentives etc.

4.5 PEOPLE'S PARTICIPATION :

People's participation is absolutely necessary for successful implementation of any programme. With this end in view the Agriculture Department, Assam started organizing a new social institution at grass root level called Field Management Committees (FMCs) or Pathar Parichalana Samittees (PPS) from last 10 years. This is a farmers' voluntary body consisting of 40 to 60 members living near a big cultivated field. There are about 25,000 FMCs in Assam at present at village level having coordination bodies at Block, District and at State level. They carry out mainly the functions of motivation and liaison with the Agriculture Department. The power and effectiveness of FMCs were demonstrated recently through successful installation of one lakh STW by Agriculture Department within a record time. The speed of implementation of the STW programme has hardly any parallel in India.

The tremendous social energy created by the FMCs must now be channelised for higher goals. In the present scenario of state agriculture, it is observed that an element of self-help must be introduced to tide over financial and marketing problems, the two weak links in the entire agriculture production chain.

FINANCIAL RESOURCE MOBILISATION :

The present financial resources of the state government are stated to be in bad shape. Yet the Govt. went all out to manage funds from national, international financial institutions for modernization of State's agriculture. This cannot go on endlessly without putting severe strain on states finances. Therefore, ways and means must be found out to mobilize resources internally. The FMCs can be persuaded to start saving on monthly basis which is in official parlance called Self Help Groups (SHGs). Total money saved at the rate of a monthly saving of a paltry sum of Rs. 30.00 by each member, with an average membership of 50 for each FMC can turn out to be substantial amount of fund for the entire State where there are about 25,000 FMCs.

Monthly saving	= Rs. 30.00 x 50 x 25,000
	= Rs. 3.75 crores
Annual saving	= Rs. 3.75 x 12 crores
	= Rs. 45 crores.

Saving will bring about a sense of confidence and self-respect into the minds of farmers. This will enhance their credit rating and will act as a symbol of self-reliance. Govt. may consider to partly support the managerial cost of this huge saving movement.

Finances mobilized in this manner will contribute to capital accumulation required urgently to increase output and income of farmers. Trade-off between current consumption and future investment will brighten the picture of Assam's agriculture.

The micro credit assumes great importance among the poor farmers in consideration of inability of Banks to serve the banking needs of large number of them. The FMCs can play a pro-active role in micro credit delivery to farmers.

A seminar on Green Revolution held at Guwahati on 19th and 20th June 2000 also placed on FMCs the role of an intermediary between Banks and farmers for smooth delivery of credit to farmers.

MARKETING AND COMMERCE :

Marketing of agricultural inputs and outputs is the weakest spot in Assam's agriculture. There are great scopes to create marketing services from storage and transport to value addition. These being costly, technological and managerial in nature, entrepreneurship has not developed in the State due to its aloofness and inherent shortage of it in the local people. But in the context of reforms in the Indian economy, our markets are to be integrated with the national and international markets, which will bring profit and competitiveness into our economy. Given the will necessary for the purpose, the FMCs can be corporatised and managed professionally on modern lines. This corporate body can function as the business wing of FMCs with a Brand image in the line of AMUL of Gujrat. The State can boast of many modern rice mills, oil mills in oilseed producing areas like Dhemaji, Lakhimpur and Majuli and fruit processing plants in Barak Valley, Hills and in the Plains through this corporate body. It can enter into fertilizer, seed, pesticide and agricultural machinery business both in the State and in the national level.

4.6 AGRICULTURAL INPUT :

Seed Requirement :

Seed is the basic input for increasing crop production and productivity. Therefore, maintenance of genetic purity through seed replacement is essential for stabilizing the yield levels. The existing seed replacement rate (SRR) in the State as a whole is very poor. Seed replacement would be enhanced substantially (annually) by 2025. Efforts should be made to produce adequate quantity of seeds of high yielding varieties suitable for rice under different rice eco-systems. Concentration of efforts in production of high yielding variety of seeds and hybrid seeds will be through registered seed growers. Required skill and technical guidance will be provided to such seed growers in production of quality seeds in the State. In order to extend the area under HYV / hybrid seeds, the farmers will be motivated to exchange their seed among themselves. Participation of private sector will also be encouraged for seed production in the State.

High yielding varieties recommended for various eco-systems :

- | | | |
|----|----------------------|--|
| 1. | Rainfed | Lakhimi, Bahadur, Kushal, Ranjit, Monohar Sali, Masuri, Moniram, Keteki Joha, Rangali and Bhogali. |
| 2. | Irrigated area | Rashi, Lachit, Chilarai, IR-36 and IR-64. |
| 3. | Post flood situation | Luit, Kapili and Kalinga |

ESTIMATED SEED REQUIREMENT

*Area in lakh hectare
SRR (Seed replacement rate) in PC
SR (Seed replacement) in lakh MT*

Crop	Present Replacement (in %)	2001-2002			2006-2007			2011-2012			2016-2017			2024-2025		
		Area	SRR	SR	Area	SRR	SR	Area	SRR	SR	Area	SRR	SR	Area	SRR	SR
1. Paddy	1.7	27	5	0.36	30	7.5	0.58	30	10	0.72	30	10	0.72	30	12	0.86
2. Pulse	5	1.6	12	0.04	2.1	20	0.10	2.55	30	0.18	2.8	40	0.27	3.2	50	0.38
3. Oilseed	2	4.03	13	.052	4.17	18	0.07	4.30	23	0.09	4.55	27	0.12	5	35	0.17

Hybrid rice seeds are to be introduced in phases in Summer rice which is not included above.

FERTILIZER :

Fertilizer in Assam is of special significance as the State has a very low level of consumption. Although the State has achieved some improvement in consumption of fertilizer during the current 9th Plan period yet consumption level is still low compared to national average. In view of the low level of consumption, it has been proposed to make all out efforts to substantially increase the consumption of fertilizer from the current level of 29.3 kg/hect to a level of 50 kg/hect by the end of 9th Plan and 70 kg/hect from 2005 - 2006 onwards. Focus of attention has also been given in feeding the soil by way of organic manure, bio-fertilizer and green manuring to maintain the soil health.

ESTIMATED REQUIREMENT OF FERTILIZER IN TERMS OF NUTRIENT

NPK in MT

Year	Season	Area	N	P ₂ O ₅	K ₂ O	Total
2001-2002	Kharif	25.00	49172	23986	23042	96200
	Rabi	12.00	45388	22142	21270	88800
Total :		37.00	94560	46128	44312	185000
2006-2007	Kharif	25.00	62500	31250	31250	125000
	Rabi	14.90	77150	38575	38575	154300
Total :		39.90	139650	69825	69825	279300
2011-2012	Kharif	25.00	62500	31250	31250	125000
	Rabi	16.80	83800	41900	41900	167600
Total :		41.80	146300	73150	73150	292600
2016-2017	Kharif	25.00	62500	31250	31250	125000
	Rabi	18.70	90450	45225	45225	180900
Total :		43.70	152950	76475	76475	305900
2024-2025	Kharif	25.00	62500	31250	31250	125000
	Rabi	19.65	93775	46890	46885	187550
Total :		44.65	156275	78140	78135	312550

4.7 IRRIGATION :

The State has proposed to install another one lakh Shallow Tube Well (STW) by exploiting the abundant ground water resource during 2000-01 immediately after completion of 70,000 Nos. of STWs currently being undertaken. It is expected that after completion of the proposed one lakh STWs, the assured irrigation coverage will stand at 7.27 lakh hectares during 2000-01 itself. The balance of 2.73 lakh hectares against the target of 10 lakh hectares would be covered in the succeeding year of 9th Plan by installation of STWs and by exploitation of surface water bodies abundantly available in Assam.

Keeping in sight the ground water reserve of the State, exploitation of surface water by way of Flow Irrigation Projects needs pointed attention. In addition construction of reservoirs in drainage systems will ease flood problem and create irrigation potential in the State.

4.8 AGRICULTURAL MECHANISATION :

Timeliness being the essence at every stage of an agricultural operation, dependence on the use of different types of machineries is inevitable. The increasing demand for utilisation of farm machineries also stems from the need to economic farming activities and minimise the cost component on labour, which is always on an increasing trend. Besides the availability to a labour force of other equally remunerative but with less drudgery activities than agriculture restrict the availability of work force especially at crucial stages during agricultural operations.

It is therefore necessary to introduce the use of different types of machineries whether it involves the use of tractors and power tillers for ploughing, or transplanters for sowing or a harvester after the standing crop has matured to even a mechanical drier to reach a desired level of moisture content. The wide range of machineries shall be the ultimate goal of the process of mechanisation in the State.

Mechanisation as a mode of practice in agriculture by the use of tractors and power tillers has been dotting the agriculture scenario in the State for many years now, although in a limited scale. Hitherto with the majority of the farmers cultivating only one crop in a year, a farmer has plenty of time in hand, and the need to rush through after harvest of one crop never occupied the mind of the farmer. It has only with the recent increase in coverage of area under irrigation, mainly through Shallow Tube Wells, that a farmer has now decided to cash in on the facility available with him and take to cultivation of an additional second or third crop, especially Rabi. There has been a perceptible increase in the area under

double crop in the State from 26 percent at the end of VIII Plan to 33 percent in 1999-2000 and expected to increase further to 50 percent by the end of the IX Plan. And therefore mechanisation has become inevitable means to march ahead rapidly to usher agriculture revolution in the state.

Mechanisation includes the entire gamut of agricultural operation starting from ploughing the land by means of power tillers and tractors to transplantation of seedlings by means of a transplanter down to harvesting of a crop harvester. The post-harvest activities would also require proper storage and reduction of the moisture content up to a desired level. Therefore, this would invariably point towards preparation of vision plan which would provide thrust on key focus areas for creating the impetus towards mechanized agriculture in the state.

In the IX plan (1997-2002) for mechanization of agriculture in the state, the following will be key focus areas.

The use of improved and efficient implements, pre and post harvest equipments and machineries by way of support programme and also emphasis will be provided for increasing availability of mechanical power in pre & post harvest agricultural operations. Agro-processing activities relating to perishable and durable agricultural produce in the rural areas will be encouraged for establishment of small-scale units (SSI) keeping export promotion in view. Farmers would be motivated for scientific storage of grains through metallic Bins etc. for grains saving.

Special emphasis would be laid on strengthening Agricultural Information Network to provide Agro-meteorological database for weather monitoring, forecasting, surveillance early warning system for natural calamities for efficient crop husbandry with mechanisation.

Augmentation of employment and income generation would be encourage through agricultural equipments and machineries servicing centres, Agro-processing industries consultancy, contract jobs, spare parts shops etc. in the rural areas of the state.

In the X PLAN (2002-2007), the key areas in the plan will be as follows :

Emphasis on increasing availability of mechanical power for pre & post harvest agricultural operations through Tractor, Power tillers, self propelled type Rice Transplanter, Tractor drawn modular Planter, self propelled type Reaper, power Paddy Thresher, Multiple crop Thresher, Harvester combine, Mechanical grain Driver etc. and to encourage post harvest processing through machines like Dal Processor, Oil Expeller, Potato peeler. Scientific storage through high metallic Bins and development of Cold chains for perishable agricultural commodities in the state will be given high priority. Promotion of servicing centers for agricultural machineries and equipments and also custom hire service with avenues for employment generation will be emphasized along with strengthening agricultural database management for efficient crop husbandry through machanization under Integrated Intensive Farming System. The strengthening R&D activities on location specific problems of relevant mechanization, training and development need of farmers specially of rural youth in agricultural mechanization will be given high preference.

In the XI PLAN : (2007-2012) key focus areas will include the following :

Emphasis on increasing availability of mechanical power for pre and post harvest agricultural operations through Tractor and other equipments and machineries for different crops including spices and horticultural crops and encouraging post harvest processing through machines like Dal Processor, Oil Expeller and other equipments for value addition keeping in view export promotion of agro-products. The scientific storage of grains through silos and metallic high bins for grain saving and also expansion of Cold chains for perishable agricultural produce will be prioritized. Expansion of agro-processing and agro based activities relating to perishables and durables in rural areas with export orientation, upgrading and strengthening Agricultural Information Network for efficient crop husbandry through advance planning, and strengthening R&D activities for technology up-gradation on the basis of location specific needs for agricultural equipments and machineries will be the prime consideration. The training and development need of farmers especially of rural youth on mechanization will invite special attention in key focus areas.

The XII PLAN : (2012-2017) will cover the following core areas in the planning on mechanization :

The increasing availability of mechanical power for pre and post harvest agricultural operations through Tractor and other equipments and machineries for different crops including spices, floriculture, medicinal and aromatic plants including other horticultural crops will be given emphasis. Encouragement of post harvest processing of different crops and also value addition for export promotion, scientific storage of grains and agricultural produce through silos, metallic high bins and other innovative structures for reduction of loss in saving would be emphasized. The upgrading and strengthening of Agricultural Information Network and database management for sustainable crop husbandry through mechanization with advance planning will be given due consideration. The strengthening R&D activities for technology up-gradation on location specific needs and also training and development needs for farmers specially of rural youth on farm machineries equipments will also be emphasized during the plan period.

The XIII Plan (2017-2022), shall concentrate primarily on the following key areas :

Stress will be given on increasing availability of mechanical and electrical power through diversified use of pre and post harvest agricultural machineries and equipments and also for encouraging post harvest diversified processing with value addition for export market through innovative equipments and machineries. Continuous up-gradation and strengthening of Agricultural Information System through *Net* for efficient crop and basic resource management. Opening up of employment avenues through ancillary units related to agricultural equipments and machinery manufacturing, servicing centres, consultancy and other jobs would be given due consideration. The strengthening of R&D facilities with support from knowledge centres and also development of patent for indigenous equipments and machineries under farm mechanisation will be given emphasis. The training and development need of knowledge workers as well as farmers for updating information on innovative technology and farm products would be the prime consideration for the plan period.

In the XIV Plan (2022-2027), the key areas in the perspective plan shall include the following :

Emphasis shall be given on increasing availability of farm power through improved models of tractors and other pre and post harvest equipments and machineries for different crops and to encourage diversified agricultural processing and value addition of product for export market at rural areas. Strengthening of capacity building for farm power infrastructure at FMC levels and sophisticated pre and post harvest equipments and machineries for horticultural crops, spices, medicinal and aromatic plants and other cash crops will be given preference. The strengthening of Information Centres on agriculture for farmers access through *Net* technology for efficient crop husbandry through satellite derived information from **INSAT** will be a key focus area of the plan. The promotion of database for entrepreneurship development for S.S.I. Units relating to agricultural equipments and machineries, consultancy, custom hire & servicing centres would be given priority during the plan. The strengthening R&D activities in knowledge centres for farm equipments and machineries for customized products, patent and innovative research on mechanisation will also be given due consideration. The training and development opportunity to knowledge workers as well as farmers at village level for updating information will be given high priority.

4.9 TRAINING :

Training is most important tool to improve effectiveness of people in their work place. In view of the importance attached to agriculture by Assam Govt. heavy financial investment planned by it and the necessity of absorbing a large young labour force in agriculture, training has assumed special importance. During the next two decades there will be great changes in demand of commodities, production and processing technologies, production relations and institutions. To cope with the changes, design of training and its delivery methods will have to be constantly updated. Solutions of today will be fast obsolescent. Therefore, a proactive training policy will be necessary to take care of necessities of changing times.

There are many traditional and new areas of learning for vast agricultural activities proposed during the next two decades for persons directly engaged in farming, persons directly engaged in off-farm activities and members of social institutions like Field Management Committees (FMCs).

There will be many new areas of skill development to sustain agricultural production in the coming decades. Some of the new learning areas are - cultivation of hybrid rice, pulse and oilseeds as intercrop and main crop throughout the year, new spices and condiments, floriculture, economics of water use, environmentally viable production methods, production for exports, agro-forestry, use of bio-control agents and biotech seeds, tissue culture plants, use and maintenance of new generation farm machineries and packaging etc.

Moreover, knowledge and skills of management like leadership, planning, communication, information systems use, business planning, budgeting, record keeping and market information use are important areas of learning. The extension machinery will also require training in the areas of precision farming, phytosanitation, food sanitation, eco-friendly farming system and general management.

In the light of the above, training infrastructures have been built in the state for middle aged and young farmers by the Directorate of Agriculture. A farmers' training programme for young farmers are to be formulated in every training center. Establishment of farmers' training schools were started in Karnataka in mid thirties and these are functioning till the present. Besides there are training centers set up for young farmers with international funding. Assam can also propose to set up training centers in each subdivision of the state in the near future.

Farmers' needs to be looked from three angles i.e., farm, farmers and farming system. The farmers need to decide on the output requirements and input needs for the resources (land, water and capital). The farming system involves the technology and package of practices for sustainable agricultural development. It is necessary to orient him on agro-climatic planning approach for his acceptability towards mixed farming strategies.

4.10 INFRASTRUCTURE :

1. ROADS :

Due to either absence or poor shape of rural roads, agricultural commodities in the interior villages are sold at non-remunerative prices or get wasted. Endeavours made so far in Assam to improve rural roads and bridges through the World Bank (ARIASP) and NABARD programmes as well as through District Rural Development Agencies have yielded good results. The scope of such works must be widened now to support the modernization of Assam's agriculture.

2. TRANSPORT AND STORAGE :

Marketing weaknesses have prevented stability in production and kept productivity of crops low. Improved storage, transport, market yards and market conditions will automatically reduce the gap of the price spread. Government support in transport particularly to provide refrigerate container trucks / vans for perishable commodities like flowers, fruits and vegetables will benefit the farmers immensely.

The importance of storage is hardly seen or realized. Very high degree of loss of cereals and grains occurs during storage which ranges between 20 to 50% loss. The importance of storage increases with the increase in production as seen in Assam at present. Most modern community storage structures like silo bins and for rural households ordinary metallic bins are required to be made available, in easy term. The storage space of Central and State Warehousing Corporations are also to be augmented immediately. This will help in reducing storage loss. Assam at present suffers badly from the dearth of cold storage space. Urgent steps is required to be taken to establish cold storage chain in the State in a time bound manner to reduce loss of perishable agricultural commodities. A new thinking for formation of central auction markets as well as improvement of rural markets are required to be taken up.

3. POST HARVEST MANAGEMENT :

Post harvest management of commodities though related to storage as mentioned above, there is specific areas to be attended to due to high rainfall in Assam. Assam has decided to go in a large scale for summer rice production. Harvesting of summer rice coincides with rainfall. Threshing and drying of summer rice during rainfall are serious problems faced by farmers. Therefore, in areas of summer rice production, drying yards and storage structure are to be constructed in villages to prevent summer rice loss.

4. AGRO-PROCESSING :

There is vast scope of value adding agro-processing industries in the State. With great surpluses in rice in the near future, establishment of modern rice mills will give a boost for export promotion. Besides, dal processing and oil extraction are two other fields which can benefit the State.

Considering the abundant production of fruits, vegetables and spices in the State, there are vast economic possibilities in the agro-processing sector. This has been discussed under Horticulture.

5. BANKING :

The banking infrastructure is poor in Assam. Banking must play a complementary role in modernising our agriculture. The present credit : deposit ratio of banks in Assam is low, i.e. about 30%. This has to be increased to much higher level in the future. Besides banking, other service infrastructures like insurance and marketing are also poor. Serious efforts are needed to activate the banking sector to participate in agricultural development of the State.

6. HI-TECH AGRICULTURE :

In the perspective of next quarter century, Hi-tech agriculture has a dominant role to play like production of horticultural and floricultural planting materials together with production of genetically modified seeds of crops to cut down the cost of insecticides and to increase productivity. Moreover, Hi-tech agriculture will be essential to promote exports and increase earning of the State. A high level State Committee or Authority may be formed to give direction to agricultural research including bio-technology in the State which will also oversee infrastructure development and entrepreneurship motivation activities.

4.11 TRADE WITH NEIGHBOURING COUNTRIES :

Assam is going to emerge in the near future due to its strategic location as door way to the South-East Asian markets. There is great scope for export of agricultural produce of the State / Region to these South-East Asian countries. Opening of more border trade, Stillwell high way and conversion of the L.G.B. Airport to an International Airport will stimulate trade with S.E. Asian countries. In order to meet international standard for export of our produce, phytosanitation and food sanitation will be new dimensions of marketing.

4.12 W.T.O. REGIME AND ITS IMPLICATION FOR ASSAM :

The World Trade Organization (WTO) evolved through Uruguay Rounds of Negotiations of General Agreement of Tariffs and Trade (GATT) and was born on April 15, 1994 in the Ministerial Meeting held at Marrakesh in Morocco. India has ratified the WTO Act and is bound to give effect to the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS). In accordance with the provisions of TRIPS, Govt. of India introduced a Bill in Parliament on 14th December, 1999 called "THE PROTECTION OF PLANT VARIETIES AND FARMERS' RIGHTS BILL 1999". This Bill was sent to a Joint Parliamentary Committee and has been returned to the House in April. The Joint Parliamentary Committee visited Assam on 09.02.2000, held discussion with farmers, scientists, planners and government officials to elicit their opinion. The main purpose of the Bill is to provide for the establishment of an Authority to give an effective system for protection of the rights of the plant breeders and farmers, and to encourage the development of new varieties of plants. There are certain reservations about this Bill, which are discussed below.

1. Although the Bill has dealt in considerable detail about protecting the rights of plant breeders, the farmers' interests were confined to a single paragraph. The Section 31 states that "Nothing contained in this Act shall effect the right of a farmer to save, use, exchange, share or sell his farm produce of a variety protected under this Act :

Provided that a farmer shall not be entitled for such right in case where the sale is for the purpose of reproduction under a commercial marketing arrangement".

The above section does not allow economic gains to our farmers. Even if government wants seed production of a variety protected under this Act through a seed village programme or certified seed production through Field Management Committees (FMCs), it will not be possible under this Act. Unlike west, our society is cohesive and farmers' activities are community orientated. Therefore, there should be relaxation in this Act for community purposes.

2. The Bill has no provision to protect traditional knowledge of indigenous and tribal societies living in small areas. These societies have built knowledge systems around medicinal properties of herbs and plants. There is scope of multinational pharmaceutical companies pirating and patenting their knowledge with no benefit reaching to those communities which devoted centuries to build such knowledge.
3. New varieties are registered if they fulfill the criteria of "novelty, stability, uniformity and distinctiveness". Traditional societies also have bred many varieties through selection over ages. But they cannot fulfill the requirements of registration.
4. The North Eastern States are very rich in biodiversity and tribal communities. Law should protect their rights to prevent piracy of their seeds, plants, bio-diversity which have been preserved by the farming and tribal communities. It is not known how the Biodiversity Bill to be introduced in the monsoon session of Parliament can protect our biodiversity.
5. On the clause of benefit sharing, the Bill stipulates that claimants to benefit will have to prove their contribution to creation of knowledge of a new variety. Farmers lack the capacity to do it. The Authority proposed under the Bill has no obligation to make its own inquiries to confirm whether anybody has pirated traditional knowledge or whether the claimant deserves benefits.
6. Patenting is allowed only on new knowledge or mutated genes under TRIPS. On the basis of it, India was able to challenge the neem patent given in the U.S.A. Such state interventions are possible for products like turmeric and basmati rice used over wide regions of the country. But tribal and farming communities of small areas who have developed knowledge cannot protect their rights.
7. The multinational companies have entered the Indian seed market in large scale. It is possible for them to produce new plant varieties with state-of-the-art technology in genetic engineering. The possible impact of genetically engineered seeds on the environment and human and animal health is not known. However, the Bill has provision to exclude registration of a variety under Article 29 where prevention of commercial exploitation of such variety is necessary to protect public order or public morality or human, animal, plant life and health or serious prejudice to environment. The proposed Bill does not put the onus on the breeder to prove the

environment and health related impact of the new seed. Therefore, multinational seed companies will have free play to act without any concern for health and environment. The pertinent question is who will do it.

8. There are certain rice varieties unique to Assam like perfumed and glutinous varieties. Besides, Assam is extremely rich in biodiversity of citrus wealth. The plant breeders of Assam should make endeavours to register more productive varieties of rice and citrus under the Plant Varieties Bill. Then these breeders become automatically eligible to register their varieties in the convention countries with benefits coming on the heels of such registration.

Besides the implications of TRIPS related matters discussed above, there is another important instrument of WTO called the Agreement on Agriculture (AOA). The AOA favours transnational agribusinesses. The multinational seed companies will have access over agricultural resources and markets. The importance of providing necessary flexibility for the adoption of domestic policies by central and state governments has been impeded which forces import of food and markets being flooded by multinational seed companies.

4.13 INFORMATION TECHNOLOGY :

In keeping with the requirements of the present information age to store, process and transmit information, Information Technology (IT) which is a mix of computers and telecommunication has developed as a potent tool for fast socio-economic progress. Although Assam missed the boat of technological revolution in the past, she cannot afford to miss the present one. IT for agricultural sector cannot be seen separately from IT for the people. The fields where IT inputs will be highly productive in agriculture are given below.

1. ADMINISTRATION :

Agriculture department has a very high degree of public interface. In order to make this department effective and transparent, use of IT has become very important. This can be achieved by taking advantage of existing government telecom network to link all Block, Sub-divisional, District, Agricultural Offices with the Zonal Offices, the Directorate and the Secretariat and Agricultural Research and Training Institutes within the next five years.

2. FIELD MANAGEMENT COMMITTEES :

The FMCs have been playing a vital role in Assam's agriculture. This institution has been projected as the hub of the future agricultural development activities in the state. In order to empower these 25000 and odd FMCs in the state, a scheme may be proposed to network the FMCs which will be owned and managed by themselves. In this connection, the advice of Dr. M.S. Swaminathan, UNESCO Chair in Ecotechnology and Chairman, M.S. Swaminathan Research Foundation, Chennai in the Seminar on Green Revolution held at Guwahati on 19 and 20 June, 2000 that user-controlled, managed Knowledge Centres based on IT should be established throughout the state. These Knowledge Centres may be established in every Gaon Panchayat and the FMCs may be linked to these knowledge Centres.

3. INFORMATION ON UNEMPLOYMENT :

IT may be used to ease the unemployment position in rural areas by training and providing job in the IT sector. IT may also be used to monitor the knowledge and skill levels of the unemployed and in design of training to make them fit for gainful employment.

4. INFORMATION ON PRODUCTION TECHNOLOGY AND MARKET :

IT may be used to provide access to farmers to technological information on production methods and marketing of inputs and produces.